Engineering & Mining Journal

Vol. IX. [New Series.] [Vol. 1.] No. 3.

THE KANSAS CITY REVIEW.

OCTOBER, 1885.

STORAGE

THEO. S. CASE, M. D.,
WARREN WATSON,
} EDITORS.

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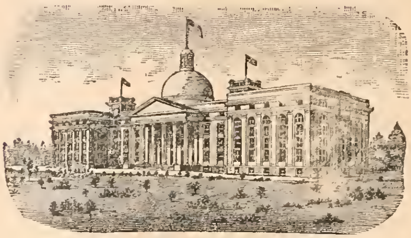

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WORDS OF PRAISE.

I congratulate you on the improved prospects and increased size of your journal. S. D. PEET, *Editor American Antiquarian.*

I am much pleased to see the Review again on its way, and I trust it will flourish. ROMYN HITCHCOCK, *Editor Microscopical Journal*

The Kansas City Review's modest cover does not in any way detain the gazer, but a glance beyond lures one to read on, and, reading, he becomes convinced that Kansas City literature, though it is from the West, has made a career for itself. We learn through the Periodical of a paper on "Photography and Medical Jurisprudence," by W. Matthews.—*Photographic Times and American Photographer.*

I herewith enclose $1.00, which I believe pays for the Review up to January, 1886, as per your advertisement. Congratulating you upon the auspicious commencement you have made in your new enterprise, I remain,

Yours Truly, CHAS. E. PUTNAM,
Pres. Davenport Academy of Science.

I am gratified to note the great improvement in the appearance of the Kansas City Review. Your periodical has a mission of good to humanity in the West, grander than that of 1800 years of pulpit bigotry and belittling of the creative mind of the universe. It is time for man to be taught truth in his childhood without having to awake in after years to the fact that much of his early training was a waste of rubbish and falsehood. May your prosperity be as unbounded as it is disinterested. WM. HOSEA BALLOU.

THE KANSAS CITY REVIEW,

DEVOTED TO

Science, The Arts, Industry and Literature.

VOL. IX. OCTOBER, 1885. NO. 3.

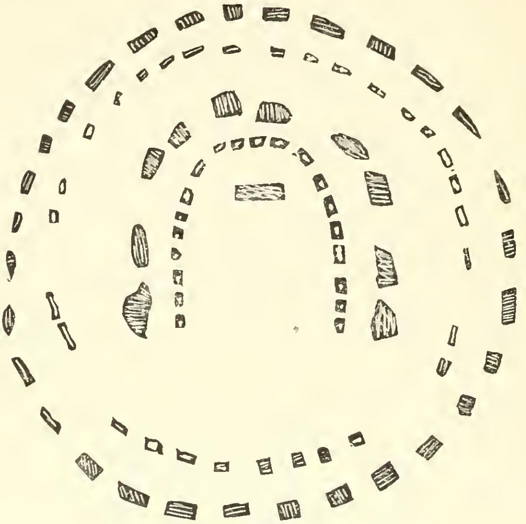
STONEHENGE AND AVEBURY.

Wiltshire, an inland county of England, contains the two greatest circular ruins of pre-historic times that may be found either in the British Isles or in Europe. Stonehenge, which has received the greater notoriety, is situated in the center of the plain of Salisbury. It is located two miles west of Amesbury, and seven north of Salisbury. The plain is an undulating chalky table-land, drained by the river Avon, and having an elevation of five hundred feet above the sea level.

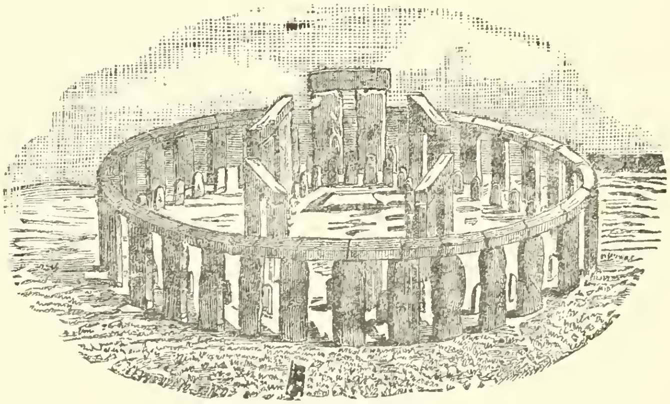
In the vicinity of Stonehenge are about four hundred tumuli, ten other ancient structures, the camp of Vespasian, camp of Clorus, the remains of two Roman roads, and the site of the Roman city Sarum.

In the early part of the present century Stonehenge was comparatively entire, but at the present time, appears to be little more than a confused mass of moss covered stones. A close inspection, however, enables one to trace out its original form. Originally it consisted of two concentric circles of upright stones which enclosed two ellipses, the whole surrounded by a circular embankment and ditch, the wall being fifteen feet high, and one thousand and ten feet in circumference. Exterior to the outside boundary was a single upright stone. To the north-east was an approach or avenue, bounded on either side by a wall and ditch.

The structure itself was composed of one hundred and forty blocks of erratic sandstone and boulders, weighing from ten to seventy tons each. Other stones of the same kind may be seen lying around the country, all of which appear to have come from the north of Scotland during the Glacial Age. The outer circle consisted of thirty stones fixed upright, three and one half feet apart and connected at the top by a continuous series of imposts, sixteen feet above ground. The stones composing this top layer were squared, rough-hewn and dovetailed together, and with mortise holes in their under sides for the reception of the tenon of the upright blocks. Seventeen of the stones of the outer circle still remain. The inner circle was removed a distance of nine feet from the



PLAN OF STONEHENGE.



STONEHENGE RESTORED.*

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*For this illustration and that of Avebury, we are indebted to Mr. E. A. Allen. They are taken from his "Pre-Historic World."

center, and also consisted of thirty unhewn granite pillars, bluish in color, varying from five to six feet in height. Eight still remain entire, with fragments of twelve more.

As may be seen from the illustration, which represents the work as restored, the most imposing part of the fabric consisted of the center ellipse within the circle, formed of ten blocks, in pairs, from sixteen to twenty-two feet in height, each pair furnished with an impost, and so arranged as to form five trilithons. Of these, eight still remain. Within this ellipse is the inner oval composed of twenty upright stones, similar in size to those of the inner circle, eleven of which are still standing.* In the cell thus formed and near the curve of the inner ellipse was the large slab of blue marble, called the sacrificial stone. Our illustration showing the ground plan will afford a good conception of the two circles and the two ellipses.

What was the object of this wonderful structure? when and by whom made? are questions which have been fully discussed, and must be of great interest to every student of his race. Any ancient structure, whose history has been lost, will have idle tales surrounding it, and plenty of theorists to put forth their ideas concerning its origin and use. Yet enough data generally remain by which its object may become known, and by whom erected. Clustering around the old ruins of Stonehenge is the legend entitled the "Dance of the Giants." It is first found in the "British Chronicle" of the tenth century, and repeated by Geoffrey, of Monmouth, and afterwards by Giraldus Cambrensis at the close of the twelfth century. The last named says: "There was in Ireland, in ancient times, a pile of stones worthy of admiration, called the Giant's Dance, because giants from the remotest parts of Africa brought them into Ireland, and in the plains of Kildare, not far from the castle of Naas, as well by force of art, as strength, miraculously set them up. These stones Aurelius Ambrosius, King of the Britons, procured Merlin by supernatural means to bring from Ireland into Britain." The story relates that Aurelius desired the structure in memory of the British cheiftains who were treacherously slain by Hengist and the Saxons, about the year 460. Aurelius was a Roman and was king of the Britons A. D. 481, which, according to account would fix the date towards the close of the fifth century.

It has been argued that Stonehenge is post Roman, not only because both Roman historians and geographers have failed to mention it, but also on account of the name itself. When these arguments are sifted it is shown that there is nothing in them. Because the Romans failed to mention the structure, that is no reason it did not then exist.

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*A recent writer in Harper's Magazine December, 1884, says "Only the central circle and a few other stones remain.

One of the most important fortifications erected by the Romans, while masters of England, was the Caledonian Wall, yet only one Roman historian makes any allusion to it. No Roman contemporary of Christ makes mention of him, yet that by no means proves that no such man as Jesus of Nazareth ever lived.

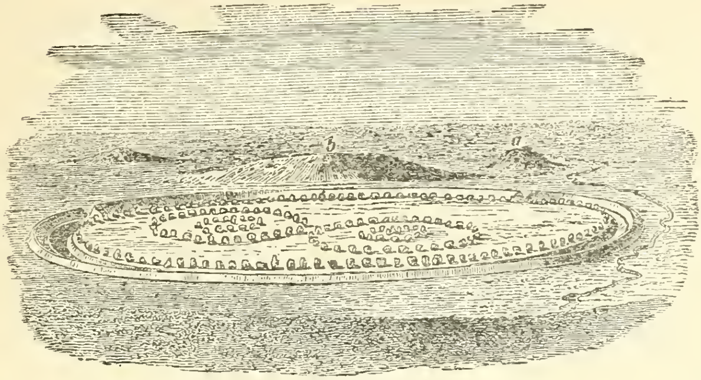
So far as the name itself is concerned, had we no other evidence, that would be a very strong argument in favor of a post Roman origin. As arguments, we cannot close our eyes to the fact, names must go a long ways. It is worth while to examine the names, for here we will undoubtedly obtain the sequel. Once the place was called *Stoneng*, and in the vicinity is still called *Stonage*. Its present name is Stonehenge, which is said to be Saxon, meaning, "hanging stones," or "Stones of Hengist," named for the mythical commander of the original Saxon invaders. Why should the Britons name this memorial structure after one who had murdered their chieftains? Perhaps a better etymology may be obtained. If the name by which the Kelts called this structure had not been departed from, no difficulty would have arisen in considering its origin and use. The great desire to throw aside purely Keltic names and adopt those of supposed Saxon origin has been a fruitful source of error. The original Kelts called Stonehenge *Coir-mhor*. *Coir* means justice, right, equity (from this word we receive our English *court*, as applied to justice. From it the French obtain their *cour*, same application). *Mhor* (*mor*) means *great*. Hence the words in combination signify "The Great Court," or Great Court of Justice." At once this would make the ruins a druidical structure. This ancient priest-hood were judges as well as members of the sacerdotal office. England was the principal seat of this order, and who knows, but at Stonehenge and Avebury the Arch-Druid presided in person.

After the Saxon and Danish invasions the Keltic (Gaelic dialect) *Coir-mhor* was interpreted by the monastic writers into the Kymric (another dialect of the Keltic tongue) *choir-gaure* or *vaure*; and in turn from the Kymric into the Latin *chorea giganteum*, or the "dance of giants." A name so peculiar must have an origin. The monks, always equal to the occasion, invented the story of the giants who danced from Ireland, carrying on their backs the great stones with which to build the temple.

The name *coir-mhor* was applied to the stone circles of Ireland and Scotland; which would clearly indicate that they were used for judicial purposes. As they were erected by the priest-hood, they may also have taken a sacred character.

A structure erected after such a stupendous amount of labor must have been considered as a place of the utmost importance, and consequently needing protection from the intrusion of both enemies and the profane. Hence we find it guarded by a wide series of dykes or intrenchments. These ditches, or dykes, or intrenchments, the Britons called *staingeach*, *i. e.* abounding in dykes or intrenchments. *Staing* means an intrenchment; *staingich*, to intrench. Probably it is here where the Saxons derived the wild legend of "hanging stones," or "Stones of Hengist."

Sir John Lubbock assumes this structure to belong to the Bronze Age. Others following the same thought assume the outer circle to have belonged to the Iron Age, because the joints in the stone would require the use of iron. It is more than probable that work was continued on the structure until it was completed, and when completed only represented the original design. If it should be clearly proved that Stonehenge belongs to the Bronze period, that would not do away with its Druidical character, for the Druids may have passed from the Bronze into the Iron Age, and for aught we know, may have commenced in the Stone Age.



AVEBURY.

This ruin is located twenty-five miles north of Salisbury and six miles west by north of Marlborough. It is the largest ruin of its kind in Europe or the adjacent islands. It was first brought to notice by Dr. Stukeley, in the year 1740, although a manuscript account of it is still in existance, which was written by command of Charles II. in 1663. The work is located on a level area of four hundred and seven yards in diameter, bounded by a deep ditch and a high embankment. The circle consisted of a hundred large blocks of stone placed on end. Within this enclosure were two other circles, one of which, a double concentric circle, consisted of forty-three upright stones, with a single stone in the center; the other similar to it was composed of forty-five stones with three large and high blocks in the center. The embankment surrounding the temple had two gate-ways, one to the East and the other to the West, approached by avenues of a mile in length and varying from thirty-five to fifty-six feet in width. These avenues were accompanied with a range of blocks on either side. Near this structure is Silbury Hill one hundred and seventy feet in perpendicular height. This is the largest artificial mound in Great Britain.

Lubbock (*Pre-Historic Times*, page 53), gives a plan of this work.

HISTORY OF THE ARYAN LANGUAGES.

I.

Nations have carefully preserved legends and myths of their early existence and wanderings, from which an approximate idea of the continuous development from their infancy towards manhood can be evolved; but there is at the present state of philological research and knowledge, very little material available for the history of the childhood of Aryan speech. We accept, we feel, we are convinced that at an early time of the earth's age there was spoken by a large part of mankind a language which, for the want of a better name, we designate by the name of a race that more than any other is the inheritor of this ancient speech; and, probably, this language was once strictly confined to the Aryans, for, as Max Muller says: "Nations and languages were in ancient times almost synonymous; and what constitutes the ideal unity of a nation lies far more in the intellectual factors, in religion and language than in common descent and common blood."

We know not, cannot even conjecture, at what time the independent development of the separate families began.

About the thirty-first century before Christ one part of the race settled the country between the Indus and the Jumna and called it Arya Varta "the Land of the Just" (hence the name Aryan). The migratory Celt had gone to Minor Asia and the North of Africa; from thence over Gibralter to Gaul, and by another way, with great probability, over the Bosphorus to Italy. Another family came later by the Caspian Sea route and mixed with, or superseded, the Pelasgi, a Turanian race, in Greece and the Celts in Italy. Whether, under the influence of the Pelasgian and Celtic, the Aryan tongue yielded its original forms and developed itself into two distinct classes—the Greek and the Latin—or whether these latter were only slightly modified by the indigenous vocabulary—is hard to decide at present.

Meanwhile the Celts settled the British Islands where they kept their language for many centuries in unadulterated purity. The Slavs roamed over the vast Sarmatian plain and cultivated the soil wherever the conditions were favorable, while the Goths, or rather Teutons, occupied the middle and the northern part of Russia. The cognate tongue to the Slavonic, the Lithuanian, can be traced back no further than historical times when it established itself in western Russia.

The Rig Veda is the oldest document of Sanskrit; the Prakrit appears as early as the sixth century before Christ; since that time the literary language gives way to current idioms which at the present time have increased to several scores and retain their literary independence. The noblest of them all is the Urdu and its sister-dialect, the Hindi, which, if they have lost the pliability and metaphysical correctness of their worthy grandam, still charm the ear with their gorgeous dictions.

The holy books of the Parsis are documents of a language that highly resembles old Sanskrit; and proves, by the retention of the terms refering to the Soma worship, that its development began contemporaneously with the settlement of the country beyond the Indus by the Sanskrit speaking people. The sibilants of the Sanskrit are aspirates in Zend; the declensions in conjugations in both are nearly alike; of the few dialects that existed after the decay of Zend, Persian is foremost; Persian has shortened the endings, simplified the verb and amalgamated with the Arabian vocabulary; it is the language in which the Koil flutes—soft, rolling, from cadence to cadence, lulled by ingenious word reverberations.

From the testimony of early historians, and from the few inscriptions existing in Asia and Europe it is generally accepted that Gallatia in Minor Asia, Gallia of Cæsar, Gaedhel of the Irish, and Haldgastes of the Teutons are identical with Celt; it is also believed that the speech of the Gallatians, Gauls, and early inhabitants of Britain was identical, and that only after the settlement of the Gauls in the British Islands it separated into Irish and British. Of the Irish at the present three dialects are extant: the proper Irish, the Scotch Gaelic, and Manx; of the British also three: Kymragor Welsh, Armoric, and Cornish. Armoric stands in the same relation to Cornish as Gaelic to Irish, and Portuguese to Spanish. The Irish is nearer the original Celtic than the British, as it retains copious internal changes in declensions and conjugations which British has nearly all lost. The tip of the tongue pressed towards the teeth, being pre-eminent in the enunciation of the consonants, aspiration and ellipsis is often the result, which consists in softening the hard consonants and suppressing the harder before a softer one. If a language is to be judged by its best and most persistent productions I should call the Irish—the lyric language—very well adapted to wed Music to the immortal Muse. Following the mythical genealogy of the Greek people the Æolic dialect is the oldest, then came Doric, then Ionic; this fully agrees with what we can infer from the fragments of Æolian, Dorian and Ionian literatures. Æolic, with its prevalence of the *o* and *u* sound, though so well moulded into a language of passionate love by Sappho and the other Lesbians, has rarely been used for literary purposes. It was regarded as a barbarian dialect by the Athenians. The earnest Doric with its broad *a* was well calculated for choruses in tragedies and war-clamors. The luxurious Ionic abounded in soft *e* and admitted of various uses to the sensitive ear of the Greek author. The mean of Ionic and Doric, the Attic, began to set aside all other dialects in the middle of the fifth century B. C. and presents a most artistic and perfect structure of grammatical forms. Only little was it changed in Alexander's times who carried it to his conquered nations, nor was it changed later on by Alexandrian writers; even the Hellenistic Greek of the Septuagint and the Byzantine Greek of the middle ages have merely added some barbarian words, and neglected established grammatical rules, rather than brought in new forms. The modern Greek, of which examples are to be found as early as the sixteenth century, in its literary and conversational form as used by the educated classes, is ancient Attic made easy; the language of the vulgar deviates from it only in a motley collection and incorporation of Roumanian, Slavonic and Turkish words into its vocabulary.

Not so happily has fared the Latin, the conqueror of the world and the master over educated minds in Europe as late as the eighteenth century. Among the Umbrian, Oscan and other dialects, Latin can be studied in its archaic form on sundry inscriptions and in ancient imprecations; it became soon the language of the subtle lawyer and the daring warrior and was in the flower of grammatical and rhetorical development in the Augustan age; a fine satire pervaded it; the people spoke it; the soldiers and conquered nations used it in Spain, in England, in France, in the Alps, on the Danube. Rome fell, and the Latin language with it; after this it led a precarious existence in the Catholic church and in sequestered cloisters up to the latter part of the middle ages and at this period very justly deserves the name of Kitchen Latin.

In the thirteenth century the Italian people began to cherish a patriotism for the vulgar tongue which was far softer than the original Latin. About that time the Spanish dialect, influenced by Gothic and Arabian, brought forth its full-sounding, silver-clanging, chivalrous Castilian in ballads and romances; then borrowing some from the French and some from the English it sent off a shoot as Portuguese. The French itself—a hashed, barbarous Latin in the ninth century—began to acquire rounded shape, and to vie in elegance with its older sister, the love-singing

Provencal. Only very lately did the Roumanian spring into a written existence, a remnant of rustic Latin, seasoned with a Slavonic vocabulary. A few other waifs are to be found within the Alps.

Hardly any family is so well provided with a numerous and strongly resembling posterity as is the Slavonic. In earliest times we hear already of Polish, Bohemian and Bulgarian. From their inter-marriage arose those numberless Slavonian, Slavac, Croatian, Ruthenian, Carpathian and other dialects. The Bulgarian was a harsh, complicated language, and in the ninth century of the national existence of the Slavs it became the church language of the Greek Catholic Slavs. This was superseded later by the New Bulgarian, an easier and more fluent speech. The influence of Bulgarian on the native dialects was very great; with the Muscovitish it gave the elegant literary Russian language as early as the sixteenth century; side by side with it went the development of the Little Russian and Servian, Bulgarian and others. The Polish gave no literary off-shoots; it is more plastic than the Russian, more sensitive to consonant changes, and has more nearly retained the nasal sounds of the Old Slavonic. The Bohemian in its form is nearer the Russian than the Polish, has broad vowels and is spoken from the chest. As all of the Slavonic languages stand closer together than French and Spanish and the other Romance languages, it has been a dream of the Panslavist to create one common literary language for all: a dream, and a fair dream it is! Were it not for the Lettish, a child of the Lithuanian, which possesses lyric poetry and a remnant of an epic poem, and is spoken by, probably, half a million of men, the Lithuanian would hardly be noticed; still on account of its peculiar structure, in which it resembles the Sanskrit, it is a valuable factor in philological research and will help some day to elucidate the history of the Aryan tongue.

In the fifth century the Goths appeared in Europe; but Teutons there had been before in the woods of Germany; it is yet a disputed question whether the Gothic should be regarded as the prototype of Teutonic or as a separate branch of the same family. The Teutonic is divided into the Eastern—the Scandinavian class—and the Western, which again is sub-divided into (1) Frisian, Saxon; (2) Frankish, Hessian, Thuringian; (3) Allemannian, Bavarian. The Old Scandinavian in its almost ancient purity is still spoken and written by the Icelanders; while in a more developed state it has become the language of the Swedes. The Norman pirate was seldom at home and with his booty brought back German and French influences, and in course of time the Swedish language, shaded with a German construction and phraseology had found it necessary to form a literary language of its own—the Dano-Norwegian tongue.

The Frisian and Saxon gave the Nieder-deutsch, the Frankish, Hessian, and Thuringian, the Mittel-deutsch and the Alemannian and Bavarian the Ober-deutsch. The Mittel-deutsch went through the successive changes of Alt-hoch-deutsch, Mittel-hoch-deutsch and Neu-hoch-deutsch, in which form it is the literary mean of the savant and the vernacular of the educated classes. The Frisian and Saxon in the neighborhood of Celt and Briton, and under the influence of Norman and Norman-French, has become the English language.

The English language has broken down all walls and avenues in its grammar, mutilated the bodies of words and left only the trunks of them; it has a code of vowels and consonants which are pre-eminently adapted for "spitting, and spluttering," or as some say, to be chirped by sparrows—and still it is the most wonderful in the labyrinth of the Aryan tongues. It has more people under its sway than any other, and has produced a variety of literature such as no other on earth can show. It has ransacked all recesses of human knowledge and feelings, and by dint of its terse and energetic character become the foremost of them all. What its position in the future will be is hard to say; let us hope that it will add much to the unification of the present Babel of tongues and reduce them to a number of worthy representatives of the Aryan speech.

II.

I have given a succinct history of the Aryan languages, as they appear on the scene of Aryan countries to the historical, or scientific, student in their life, development and ramifications, and shown how they were succeeded by their more intense vernaculars, in endless variety in Europe, Asia, and America. We can from the vast material of literary languages re-construct with an exactness befitting my purpose the original Aryan; now my purpose is to follow up the tendencies of the languages to differ from their mother-tongue, to explain the course they have been taking, and to forecast the probable future of these languages; for what historian is so deliberate and cold-blooded as to leave out his favorite idea about the destiny of the people, the state, the science, whose vicissitudes he is delineating?

The organic part of the language is the action word, the noun, the pronoun and the structure of the sentence, and it is here that we are mainly to look for the degree of relationship between the different languages and their connection with the Aryan.

The action-word in Aryan was composed of the uninflected part (which for shortness sake I shall denote by the term *verb*) and the pronominal ending. A rudiment of a past and future tense, and also of a conditional mood existed, but these were not stable enough to influence alike, permanently, the various descendants. Thus many languages had to form their tenses themselves. The past was composed of the verb, the word corresponding with *have* and the pronominal ending; the future was less certain and coalesced either with *have* or with *be*. The pronominal endings lost their independent meaning, and were regarded as necessary appendices to the action-word. The past tense, not being sufficiently well established, the Aryans stressed the main part of the verb, as little children do when they refer to events recently or long since past. This is all we can say with certainty about the Aryan action-word. Let us look now to the respective construction of the action-word in early languages.

The last part of *luomen*, *amamus*, *buailmid*, is physiologically the same; even such apparently diverging endings as in *henti*, *amant*, *luousi*, *buailed*, are identical, every one accepting a different shape under the influence of phonetic laws. Reduplication in the past tenses of some languages and internal change in others, are what I have denominated as *stress* in Aryan. The Greek *lelukasi* equals *stress* plus *verb*, *ex* plus *si*; *amavit* equals *am* plus *hab* plus *it*. The development of the future belongs separately to every family. Later on, the tenses became more and more conventional. The original composition was lost sight of entirely; pronouns were being added in the beginning; and still later, as in the case of the Romance, the corrupted old forms are being pushed out by original compositions, analogous to the primary building up of the Aryan.

Toreeaun, in his Roumanian grammar, after enumerating the Imperfect, Perfect, and Pluperfect Simple and giving their paradigms, says:

"These perfect and pluperfect tenses are *frequently* used in narration, whereas in conversation in speaking of past time the following compound perfect is used: *eu am arat* 'I have ploughed.' Analagous compounds are: *Ich habe geschrieben*, *Oeilo Bailei*, I shall throw.

Grammatically and, may be, also logically the Aryans conceived the adjective, the pronoun and the substantive as existences, as objects; declension acquired shape before the distribution of the families and was the result of a loss of meaning of specifics, particles and prepositions which were added to the word to form the needed relation. The oldest languages have so many things in common in the formation of feminines, and in declensions, that there is no doubt of the common derivation of their forms from the mother-tongue. The tendancy of the old languages to make *a* prominent in the feminine and *m*, or a nasal *n*, or a vowel in the accusative, press through in the most of the modern languages. In course of time the case-endings became fewer and fewer until they disappeared in the most, so that prepositions had to be put in front of the word to be affected. Instead of *amici* we have *del amigo*, instead of *godrar* and *godri* and *godum* we have *of the man, to the man, from the man, with the man,* and this shows that English has lost all respect for and sense of the rich nomenclature of Aryan grammar. The order of the sentence in Aryan seems to have been originally the inverted, that is, the verb was followed by its defining subject, the attribute followed the noun and the participle defining the relation stood after them. But not long previous to the distribution of the Aryan languages, when the cumbersome grammatical structure demanded greater freedom, the order in the sentence may have been promiscuous. In the most modern languages the order is direct and begins with the subject and ends with the object.

Thus we see that from a comparatively simple construction the Aryan tongue was modified to complex grammars in the classical languages; these were going up hill, until reaching the summit, a descent on the other side began. The languages are moulding themselves back into simple shapes with auxiliary verbs to express tenses, with pronouns to indicate persons, with prepositions to form relations. What will be the end of it? When the languages will have simplified so as to have reached the nearest possible approach to early Aryan form, there will be a struggle between them until the more powerful, the one which is spoken by a greater populace, will substitute the weaker, and then a few new centers will be formed for the development of those few families.

We see how in America the English language is undermining and exterminating the other Teutonic languages; the contact of the English with the German, the Danish, the Dutch, has been ominous to the latter. Where are the Knickerbockers of New York, the Swedes of Delaware? The Spanish has substituted the finer but more complicated Indian languages of the Mexicans and the Peruvians and only meets resistance from the indomitable Maya. The English has crowded out the Spanish of the Pacific coast, and before long New Mexico and Arizona will be Spanish only in tradition.

The war has begun, and the simplest language, the most adapted to every day wants, will some day remain the only important inheritor of the legacy of a people that founded *Arya Varta*, the land of the just.

HERBERT SPENCER'S ESSAY ON RELIGION.*

It was mere intellectual error which led Augustine and Calvin to begin by applying the physical law of Causality to the moral nature of man, and to end by defining the divine Predestination as *Decretum Horribile*,—which represents God as a tyrant who arbitrarily ordains both sin and its punishment and Righteousness and its reward; and is utterly oblivious of the simple truth

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*Religion: A Retrospect and Prospect. By Herbert Spencer.

"That God's first use of Sovereignty
Hath been to make our fellow-men
With all his own vast freedom Free."

For they strove to bind the moral nature by a law which pertains only to the physical universe, and which ceases to exist in the presence of Will, human or divine, just as Gravitation, Chemical Affinity, or any other so-called "Natural Laws" might cease, or reverse, their action if material things were once endowed with Will: so that water might will to flow "up stream," and solid bodies might will to fall from, rather than towards the center of the earth.

This ancient intellectual error has been repeated, in a far more pitiable and inexcusable form, by Mr. Herbert Spencer in a careful essay entitled "Religion: A Retrospect and Prospect," which appeared in *The Nineteenth Century* for January 1884, and was republished in *The Popular Science Monthly*. For Mr. Spencer, who is one of the chief apostles of the atheistic creed of Agnosticism, (like all his tribe) seeks to bind moral or spiritual truths by physical laws; a process as utterly unscientific as would be the attempt to determine the fauna and flora of any designated region by an examination of the religious notions of its inhabitants.

In the article named he first assumes the absolute verity of the physical law of Evolution, assumes that this law is as applicable to religious conceptions as to material existences, and next assumes that the facts manifested in the course of the "development" of Religion demonstrate the evolution of our Theism from an exceedingly thin and intangible protoplasm of ghostism, as the following quotations show: "How do these ideas concerning the supernatural evolve out of ideas concerning the natural? The transition cannot be sudden; and an account of the genesis of religion must begin by describing the steps through which the transition takes place.

"The ghost-theory exhibits these steps quite clearly. We are shown by it that the mental differentiation of invisible and intangible beings from visible and tangible beings progresses slowly and unobtrusively. In the fact that the other-self, supposed to wander in dreams, is believed to have actually done and seen whatever was dreamed—in the fact that the other-self when going away at death, but expected presently to return, is conceived as a double, equally material with the original: we see that the supernatural agent in its primitive form diverges very little from the natural agent—is simply the original man with some added powers of going about secretly and doing good or evil. And the fact that when the double of the dead man ceases to be dreamed about by those who knew him, his non-appearance in dreams is held to imply that he is finally dead, shows that these earliest supernatural agents are conceived as having but a temporary existence: *the first tendencies to a permanent consciousness of the supernatural prove abortive.*

"In many cases no higher differentiation is reached. * * * Thus the Unkulunkulu, or old-old one, of the Zulus, the father of the race, is regarded as finally or completely dead. * * * But with habitual wars, * * * with the compoundings of small societies into greater ones, * * * with the multiplying gradations of power among living men, arises the conception of multiplying gradations of power among their ghosts. Thus in course of time are formed the conceptions of the great ghosts or gods, the more numerous secondary ghosts or demigods, and so on downwards—a Pantheon: there being still, however, no essential distinction of kind: as we see in the calling of ordinary ghosts *manas*-gods by the Romans and *elohim* by the Hebrews. * * * With advancing civilization the divergence of the supernatural being from the natural being becomes more decided. There is nothing to check the gradual de-materialization of the ghost and of the god; and this dematerialization is invisibly furthered in the effort to reach consistent ideas of supernatural action: the god ceases to be tangible, and later he ceases to be visible or tangible. Along with this differentiation of physical attributes from those of humanity, there goes on more slowly the differentiation of mental attributes, until the harsher features are differentiated out of existence, and "divine love, divine forgiveness, divine mercy, are now the characteristics enlarged upon."

After tracing the supposititious influences of the law of Evolution through all the anthropomorphic conceptions of Deity, and assuming that the law applies to God, (as well as to man's notions of him) the philosopher continues: "Thus recognizing the fact that in the primitive human mind *there exists neither religious idea nor religious sentiment*, we find that in the course of social evolution and the evolution of intelligence accompanying it, there are generated both the ideas and sentiments which we distinguish as religious: and that *through a process of causation clearly traceable, they traverse those stages which have brought them, among civilized races, to this present form.*"

This is perhaps the highest and most recent utterance of agnosticism in regard to God; and it gives us not even a Zulu-land "Unkulunkulu" to worship: and this is just what human philosophy naturally "differentiates" by the application of physical laws to moral questions.

It must be palpable that this attempt to evolve the idea of God from "the Ghost theory," rests primarily and confessedly on the assumption that "man" was once such a hopeless idiot as to believe that he had "actually done and seen whatever was dreamed": *i. e.* that man did not know that he might dream when he was sleeping, and, therefore, believed his dreams to be veritable facts "done and seen."

The basis of the whole thing is false in fact: for there never was a time when man did not have sense enough to know when he had been dreaming. Nor is it any more true in fact that mankind ever believed that each individual had an "other-self" that "when going away at death, but expected presently to return, is conceived as a double equally material with the original." The Zulus may have had some such notion, as they are very "agnostic" tribes; but mankind never did. If it were true that man possessed this "double," or believed that he possessed it, Mr. Spencer did not know "the fact that when the double of the dead man ceases to be dreamed about by those who knew him, he is finally dead"; for while many a man has justly believed that his spirit survives the death of his body, and that his own and the spirits of other men might "return" (as many beyond any sort of reasonable doubt have done), the only reason for his "non-appearance in dreams" may be the fact that the separated spirit may have passed into conditions which render it impossible or unpleasant for it "to return"; —it may have acquired "a spiritual body," or it may have finally abandoned the hope of doing so; and in either case, might voluntarily, or compulsorily, have severed all connections with men "in the flesh." For it is abolutely certain that the first necessary work of a Soul (Life, *Psyke*) when quickened by conjunction with a Spirit (*Pneuma*) is to begin the work of erecting a natural body for itself and its conjoined spirit, as it does in the womb by the assimilation of natural aliment, primarily from the blood of the mother, under conditions of which we know something; and we may be very sure that the same soul separated from the body will seek to create a spiritual form for itself and its conjoined spirit by the assimilation of spiritual aliment, of which we know little, under conditions of which we know even less. And these conjectures are certainly as reasonable and "scientific" as any which Mr. Spencer has suggested. For what authority is there for declaring that a belief in ghosts, based upon the alleged fact that men were once so silly as to have believed themselves "to have actually done and seen whatever was dreamed," gave rise to faith in immortality, and finally to faith in one great Immortal, rather than to say that a prior belief in immortality gave rise to a belief in ghosts? Is it more easy to conceive that man believed in ghosts because they first believed that spirits which had left the body had visibly returned, or because having a prior belief in the immortality of the spirit, they thought it natural that the separated spirit would revisit formerly well known scenes? However this may be, it is not probable that belief in ghosts originated in the impossible fact that man believed in dreams as true; and perhaps we would come nearer the truth by declaring that both faiths would have been impossible to man, unless the facts existed, to-wit, that the spirit survives the body, and that it sometimes "returns"; otherwise there is nothing from which the belief could be "evolved."

It is thus made plain that the doctrine of evolution is incompetent to account for belief in the supernatural without falsely assuming it to be true that man is silly enough to receive as a fact that the "other-self" *is* "supposed to wander in dreams" and "*is* believed to have actually done and seen whatever was dreamed:" and equally plain that when Mr. Spencer asks "How do these ideas concerning the supernatural evolve out of ideas concerning the natural"? the answer ought to be that they do not so "evolve" at all, and are ideas that are in the very essence of them of an entirely different kind, and that came from another sphere of ideas altogether. For not only is it true that the attempt to apply the physical law of evolution to God (or even to anthropomorphic conceptions of him) is a mere intellectual abortion such as Augustine and Calvin perpetrated in their efforts to subject the moral nature to the law of Causality, but it belies the history of the human race.

Let us examine this assertion briefly.

The Agnostics denominate God "the Unknowable," "the Unthinkable," and by other appellations designed to express the idea that the thing spoken of is utterly beyond the range of human thought: "an Ultimate Reality transcending human thought." So far as our mere intelligence is concerned, the agnostics are unquestionably right. Jesus Christ expressed and repeatedly taught that God is "Unknowable, Unthinkable" to human intelligence; and that his personal existence would have been a blank to us forever if He had not chosen to reveal Himself to man; but the assumption of the agnostics (however essential to the statements of their atheistic creed) that our present conceptions of Deity are only the evolution or development of primitive crude notions on the subject, *is utterly false in fact:* for the simple fact is that the original faith of the primitive races of mankind was an absolutely true Theism, of which the Athanasian creed itself is a mere perversion; so that, the original Faith, more perfect at the genesis of it than it generally is today, must have been a Divine Revelation and not an "evolution" or "development" of anything whatever. It seems to be a thing utterly impertinent to the purpose to cite the idolatrous notions of comparatively modern nations like the Greek, Romans and Zulus (with Unkulunkulu at their head) upon such a question, for it must be well known that Egypt was wrinkled with age, and that the Israelites, the Chinese, and the Indians, were each "a people" centuries before these modern nations existed; and he might equally well know that the original faith of these primitive races was a pure Theism—faith in one dual God, a double Being, self-existent, that was sometime to become manifested to mankind by the generation and incarnation of a son; and that this primitive, pure Theism preceded all forms of polytheism by countless centuries; and that idolatry became possible only by the degradation of the original faith.

This primitive faith was expressed in China by the double-name Chang-Eng; and after the Chinese had vainly waited for centuries for the earthly manifestation of the one dual Deity, and faith began to fail, they first, perhaps, degraded the original Theism by considering the Igneous and Aqueous principles of nature to be the source and origin of all things, and then learned to believe that Man himself was the earthly manifestation of God, and, hence, they began to pay divine honors to their ancestors, and to "pot" and worship the bones of their fathers, a fact that is inexplicable except on the supposition that they believed Man to be the earthly manifestation.

So in India the original faith in one dual Being self-existent, as set forth in the earliest Rig-veda, was expressed by the double name Indra-Agni, and as faith began to decline they construed the divine names to signify Solar light and vapor, and began to believe that Buddha was the earthly manifestation of the one Supreme God; and afterwards Vishnoo, Siva, Brahm, and countless other mythical deities intruded into the darkened world of faith.

So, and more clearly, in Egypt the revealed name of God was Ra, and his consort, the feminine element of the Dual Being self-existent, was a female Ra, and never any created being, but essentially one with himself, consubstantial, *omoouuios;* and this one dual, double-sexed deity was to be made manifest to man by the generation of a Son, and his birth into the world. When the coming of this divine Son had been long delayed, and faith in the original Revelation grew wavering, the priests began to search for him through earth and heaven. The original conception of the Ra-ra God and a promised but unknown and nameless Son, degenerated into the mere myth of Hesiri-Hes (which Herodotus introduced to the Greeks as Osiris-Isis) and a Son called Horus. Yet it seems to be true that the priests long regarded Hesiri-Hes and Horus as a myth only, and as symbolical of God and his Son; and it undoubtedly is true that while the Egyptians worshipped God by different names at different times and places, they always carefully maintained the essential idea of a dual God made a Triad by the generation and birth of a Son. The primitive formula of faith was the Ra-ra, dual God, and an unknown Son: after that the myth of Hesiri Hes Horus: then the transformation of this myth by belief in it as a fact instead of as a symbol: then the giving of other names to the same Triad in other temples: then as the degradation of the religious idea proceeded, the idolatrous notion that the Son whom they had vainly awaited in the form of man, might come into the world as a sacred brute: then the deification of the sacred Bull Apis, and even of inanimate things as the Nile. The word Hapi which was applied to the bull-god and to the Nile, in the Hieratic speech of Egypt signifies "the Hidden," the Concealed," and undoubiedly meant to embody their priestly knowledge that the son whose manifestation was to make a Triad of the Ra-ra God, was yet "hidden," "concealed," like the undiscovered sources of the Nile and like the Divinity whom they vainly hoped some Apis might beget.

These facts and others of equal significance, leave no doubt that the original faith of the primitive races was a pure Theism, and that the polytheistic and idolatrous notions out of which he seeks to "evolve" the idea of the supernatural, was the degradation of the faith which was revealed in perfect strength and purity, and never evolved out of anything human or earthly, even as Paul said to twenty centuries ago.

[TO BE CONTINUED.]

LIFE IN UNCONSCIOUSNESS.

It is not intended to examine in this paper the metaphysical doctrines of any school of philosophy, however suggestive the title may be of teleological speculations. The era for mental gymnastics, for subjective ratiocination, is fast passing away; and marvellous as the speculations of metaphysicians may be in the laudable effort to discover a First Cause, we find now so much in the phenomenal world to engage attention that there is little to attract truth-seekers into fields beyond experience. Having assured us that there is a First Cause and that it is Infinite and Absolute, Philosophy should rest on its laurels without destroying its own edifice by attempting to define Infinity and limit Absolute Being. The old fashioned lines of Pope are applicable here:

> "Presume not God to scan;
> The proper study of mankind is man."

The subject to be discussed in this paper has been pressed on my attention from many directions and through very diverse phenomena. The facts which gave it birth are many of them old and well known even to the popular apprehension. Those that possess any novelty are attested by the universal voice of science and are no longer occult, even to the casual enquirer. That my use of these facts may be clumsy and inadequate I do not doubt; but that in the hands of a master, such as may arise hereafter, they will serve to rationalize much of life's mysteries that still vibrate to superstitious chords and remove a thousand obstructions to man's progress from animalism to the pure heights of reason and intellectual life, I firmly believe.

In the evolution of life there is a progress in two directions: (1) toward a specialization of physical functions and (2) toward the automatic action of these functions. Without the first the second could not exist, and *vice versa*.

A great writer, Thomas Carlyle, in a well known book finely says that man's "collective stock of Hancrafts, the whole faculty he has acquired of manipulating nature—all these things, as indispensable and priceless as they are, cannot in any way be fixed under lock and key, but must flit, spirit-like, on impalpable vehicles from father to son: if you demand sight of them they are nowhere to be met with." Here is a shadowy perception of the fact that all craft—all use of function—all expenditure of force—are gravitating toward automatism. The "stock of handicraft" which seems so mysteriously transmitted from one generation to another we now know is simply the stored up training of the race; training which in time becomes as purely automatic in its manifestations as the beating of the heart or the motions of the diaphragm. It is a recognition of the truth, which cannot be stated too broadly, that the higher life must be the result of organization,—the consequence of the acquisition, not of of new faculties or senses or functions, but of the power to so exercise those we now possess that their use will not be slow and painful. In modern books we read constantly of "organized memory." This expression has become a sort of new abracadabra which is lugged in to explain every dfficulty in the path of the student. If it is asked how is it that I write the words upon this page without conscious reference to the letters that compose them? the answer would be, "organized memory." If a musician, thoroughly acquainted with his instrument, should curiously ask how it is he can, without conscious volition, strike the right note in the dark, or play a difficult piece at first sight, the answer is, "organized memory," That organized memory exists is part of my proposition and memory when it becomes organized must be exercised unconsciously. But all expertness cannot be explained by this principle. In the labor of writing many things join together to produce the result. Because we do not have to consider how a word is formed in order to write it, is not a reason for saying that the letters are unconsciously in our memory. I don't believe they are. I believe that, having learned how to form a word, that word becomes a fundamental acquisition which the operations of the mind give off at the end of the pen just as though an automaton held it and the impulse was a crank and a train of wheels. The thought seeking expression adopts the word, itself an acquisition, and whenever the thought arises the word comes with it, without calling up one by one the phonetic elements it contains. Carried a step further the inaudible thought having become an audible but invisible word this invisible word becomes a visible sign of speech; and now when the thought arises the word comes also, but not alone; with it comes the written sign. No one will contend that in arranging the apparatus of vocal speech to utter a word, we consciously pay any heed to the phonetic elements it contains: no more do we consider how to form a written word. The vocal word becomes no less, no more, an organized craft than the written word. This illustration is applicable throughout the entire range of mental and physical training. Almost all our knowledge is organized and, hence, unconscious, knowledge. Though experience and precept teach us, their teachings must become organized—must be unconsciously retained in the brain, nervous-centers and muscles so systemetized that they will respond to objective, as well as sub jective, stimulation without going through a slow and painful, or any sort of, mnemonic process.

As the key of a piano when struck gives back a certain, unvarying note so do localized cells of the brain, when stimulated into activity, with the same unvarying and unconscious habit, return a definite response. But the real dispute does not depend on novel propositions to reach an elucidation. We are aware that the whole process of nutrition, as well as disorganization, is accomplished unconsciously. Place food in the mouth for instance: the salivary glands at once become active—is there a conscious message sent them from the brain? The act of swallowing, at first possibly conscious, ceases to be so when the food enters the aesophagus—indeed from the time it passes over the automatic valve that prevents its entrance into the larynx. When the food enters the stomach, a whole train of automatic processes sets in. Movements of the stomach, more or less violent, commence, which keep the food in constant motion; the peptic fluid pours from its glands in quantities graduated by the work to be done; and until this work is done a valve that almost seems to possess perceptive faculties and reason, prevents the food from leaving the stomach to perform its office of nutrition. When the food is thoroughly digested this valve opens and other automatic processes, not less ingenious and wonderful, carry the digested food through all the stages necessary for its entrance into the circulation. And here is met another series of automatic processes. This red current of life is beyond the reach of the will in its whole scope of action and office. Its ducts, its valves, its movements, its entrance into the heart charged with impurities from the waste of tissue, its passage to the lungs and other viscera for purification and oxydation, its return to the heart and dissemination through the arteries into all parts of the body, to go again and again through the same process,—all these instrumentalities and operations are automatic,—belong to the unconscious side of man; and all are instances of specialization and organization.

It is said that in the lowest forms of life the senses do not exist at all save in the form of a dull sense of touch; that this sense, at first confined to the office of recognizing chemical action and violent and abnormal shocks, became at last more delicate; began to respond to fainter and fainter impressions from surrounding objects; specialized itself first into one sense and then another, as the various etherial forms of matter constantly beat upon it for recognition, until there was added to touch the finer and yet finer senses of taste, smell, hearing and sight. Here is specialization taking its accustomed form and with it comes its concomitant, organization. For while we can prevent these senses from acting at all, we cannot control them when in healthy action, from returning their genuine impressions by any exercise of the will.

In truth we find that throughout the entire range of human thought and action, the process that we call education and organization is merely a progress toward automatism. No matter in what direction human purpose may be guided, it is found that its achievements are most puerile and unworthy so long as they are reached by trivial and tentative processes. Darwin, recognizing in a dim sort of way this general truth, so far as it concerned zoology, and attempting to organize the world's knowledge of animated nature, states that he studied for five years before speculating on the subject. That is, he attempted to place all the facts in this department of science under the dominion of Will so that they should become a part of his mind and, as constantly accessible as any other so-called natural mental furniture, such as space, time, etc.

It is these slow and tedious processes by which knowledge is gained that must be dispensed with. Knowledge of phenomena must become congenital like the senses; handicraft must indeed descend from father to son "on impalpable wings" like the functions of the viscera, before man can reach the highest place in nature. This has been the genius of his progress; organization, specialization, has led him over the tremendnous chasm from Amoeba to Man and must lead him onward still to the lofty existence wherein there must be a total unconsciousness of the phenomenal world; wherein all physical stimulations will produce action and reaction as far removed from apprehension and control of the Will as the worm-like motions of the intestines.

Now what is this process of organization but a constant and progressive abnegation of the Will so far as the trivialities of its growth are concerned? With each step taken in education the Will is relieved from primary duties. When the child learns to write without *willing* anything more than the production of the word or sentence in his mind, disregarding all questions of orthography or calligraphy, (which have become organized and need not be thought of) he has reached, by a very slow and laborious path, a stage which the man of the future will stand upon at birth.

And this brings me to the last point of my topic: Is the abnegation of Will a step to higher intellection? I believe it is. So long as an effort of will is required to direct the operations of the mind or body there must be difficulty, imperfection, delay. Once educated to perform its offices without conscious interruption, the brain will operate as automatically and certainly along purely mental lines as it now does in directing the sympathetic nervous system. Not that this abnegation of the Will can ever be real; it will be advanced to more gigantic offices. It will no longer attend to the minutiæ of things. Here and there it will set a thousand wheels in motion; and, like a god, wait for the result. The Man that I see springing from the long train of evolutionary processes will need no formal logic, no machinery of ratiocination. He will not need to be taught the multiplication table; he will not need to constantly waste life by verifying knowledge. Instead of having the body dominate over the intellect the mind will dominate over the body; but over all, as the *deus ex machina*, a gigantic and imperturable Will shall direct the course, though it may not restrain or accellerate the operations of the mind and body. Thus consciousness will be confined to purely supraphysical regions. Existence, as we now know it, will become unconscious and above and beyond the sphere of present existence, man will discover and occupy a new world more wonderful and more unexpected than that which gratified the eyes of a Columbus.

HYPNOTISM.

Hypnotism, or mesmerism, up to the present time, seems to have been looked upon as a scientific curiosity rather than as a legitimate subject for scientific investigation. The obscurity lingering around its anatomical basis, or, rather the pathological changes causing it, is such that it is extremely difficult to give a rational account of its phenomena. We can know nothing of the mystery called mind apart from its connection with matter. That it is a secretion of the brain, in the sense that bile is a secretion of the liver, or mucus a secretion of a membrane, is not yet proved, and the analogy does not hold fairly good; for bile and mucus are substances which we can analyze, whereas thought is intangible. Yet for every change in the current of thought we are forced to conclude that there is some change in the instrument thinking. These changes can be produced in many ways. They can come from direct injury, from chemical action, from derangements of nutrition affecting the quality of the blood, from increase or diminution of the blood supply, from long continued over exertion. It is easy to see that if any part of the brain is over-stimulated, as it would be by an increased amount of blood, its action would be increased. There are many things, going to show too that the circulation can be increased in certain portions of the brain and at the same time diminished in others. This is supposed to be effected through the the sympathetic nerves, sometimes called the vaso-motors. Any irritation of the sympathetics causes a contraction of the muscular coats of the arteries, or arterioles, which lessens their size, and it is quite easy to see that as this irritation is limited or extended to different parts of the sympathetics the blood supply of the different organs will be varied. There are many abnormal states of the brain that we are forced to account for upon these grounds, states whose symptoms are histeria, somnambulism, trance, etc. From the nature of the case we cannot demonstrate these things experimentally, as we can some others, for we cannot cut into the brain or in any way expose it to observation while these processes are going on ; and if we irritate the vaso-motor nerves artificially we do not seem to have the means of limiting the range of irritation at will. But always, in hysteria, there is either hyperæsthesia with an increased, or anæsthesia with a diminished, flow of blood to other parts of the body ; so that it would seem as if the relation was one of cause and effect. From analogy it is fair to argue then that the same condition obtains in the brain, and if we apply the same terms to the brain as to the nerves of feeling, we have hyperæsthesias of the special nerves, as sight, hearing, etc., going to the extent of halucinations, or anæsthesias going to the extent of temporary deafness, blindness, etc.

The phenomena of hypnotism, or mesmerism, as it is commonly called, from Mesmer, the man who first brought it into existence, are, in reality, the same as those seen in other mental states that come on naturally in certain persons. The apparent difference arises from the fact that mesmerism is, in general, artificially induced and the person mesmerized is supposed to be entirely under the will of the operator. This, however, is a misconception, for at most the operator simply puts the person in condition to mesmerize himself, and then he is at the mercy of whatever impressions make themselves most prominent. In the present state of our knowledge regarding the functions of different brain tracts it is exceedingly difficult to know how this can be done. From an analysis of hypnotic phenomena it would seem that in the main they consist of an abolition of will power, leaving the man to obey reflex impulse like a machine. A reflex impulse may be obeyed consciously or unconsciously. In any event it is simply the response that a nerve cell gives to a stimulus. If there is no consciousness present, we say we have no will. For in some way our philosophy has bound up our consciousness and will and responsibility in accordance with the dictates of theology and it is exceedingly difficult to unravel the knot. We may well ask if after all the will is not a higher kind of reflex responding to stimuli from brain cells that perform those processes which we call judgments. According to our present knowledge, the will is connected with a certain portion of the brain in the same way that speech is, and if this portion of the brain is destroyed, the will or at least the power of exercising it is destroyed. Diminish the blood supply in this particular portion of the brain until there is not sufficient to provoke its activity, and let the supply remain normal in the rest of the brain and you have one kind of automatism. The arrangement of blood vessels in the brain, is such however, that we cannot suppose this to be done without affecting other portions of it at the same time, and herein lies the difficulty of explaining some of the phenomena. We do not know what portions of the brain give rise to the phenomenon that we call consciousness. If pressure be made on almost any part of the anterior portions of the brain it produces unconsciousness, and when it is taken away conscious returnsness. That is all we know. A certain modification of consciousness takes place in the hypnotic state, and this may be due to a variation in the same blood supply that irrigates the tracts of brain habited by the will.

Now what is done in producing hypnotism?

1st. The attention is fixed upon some object that tires the eyes. This seems to be very necessary in subjects that have not already undergone the process. If the object is placed so that the axes of the eyes are somewhat inclined to each other a strain is brought upon the occular muscles which finally results in weariness. An unusual exertion in any part means an increased blood supply, but if carried beyond a certain point, we lose, for a time, the power of exerting the organ. This happens with the eye. Gradually everything disappears except the article looked at; this loses its brightness; becomes black; the blood distribution is disturbed; the hypnosis commences, the pupil gradually expands.

Next, if it is mesmeric sleep that you want, approach the eyes suddenly with some object as if about to put them out and they will close. Tell the subject then that he cannot open them and he cannot. He has not will power enough to examine your assertion. He takes it for granted. There seems to be no inclination to test the veracity of any assertion and the man acts as if any impression made upon him were an actual fact. Among the phenomena developed in this state, there are many difficult to explain upon any hypothesis. Certain persons very ordinary in their natural condition become quite brilliant when hypnotized. Persons in a trance state have talked with an abnormal eloquence; others ignorant of music have suddenly developed a wonderful talent in this direction. A young Frenchman while mesmerized could solve difficult problems in mathematics and in his waking state knew very little of mathematics. Such things pass for inspiration. They certainly show a hyperæsthesia ot certain regions of cerebration. But how explain the sudden acquisition of something not before in consciousness? True enough mathematics is not a science in the sense that other sciences are. It is more a kind ot language, a knowledge of relations which seem to exist in the very nature of things and perhaps exists in us as well. Some persons seem to grasp it intuitively and in some very remarkable cases the power of calculation is joined to a mental weakness almost idiotic. By these persons problems appear to be solved by processes more direct than those found in mathematical treatises, as if a portion of the nerve paths used in calculation, a portion of the route traveled by the nerve power, had been cut off as useless. What the processes are by which these abnormal results are reached in hypnotic states, of course we do not know. We might suppose that the hyperæsthesia has aroused an ancestral memory, that it has caused the nerve force to traverse paths marked out by inheritance but not developed. So we might say in regard to music trance speaking, or any of the extraordinary powers which are so suddenly conferred. As far as I can discover these powers do not transcend what we might naturally expect from the person himself if he had undergone a process of training, and there are no extraordinary manifestations except in the line of a man's natural talents.

It is very difficult to estimate the size of the grain of truth in these manifestations. In many cases there is a tendency to deceive and in the spectators a tendency to exaggerate. But if we look upon education as it is, simply as an unfolding, a co-ordinating of the powers that are in a man already and not as a pouring in of new material, it may be more readily explained how new co-ordinations can be suddenly brought about. If anything had been accomplished by hypnotism which was before unattainable to the race, if some class of problems could be solved which had so far baffled the powers of the best of us, we might then be obliged to look outside for an explanation.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The thirty-fourth session of the association assembled under favorable auspices in the classical city of Ann Arbor, Michigan, on August 26th, 1885. Ann Arbor has an air of culture and refinement, and its selection by the standing committee as a place of meeting, proved to be wise, and most satisfactory to all who attended.

The white walls of the University, the great pillars of the porch, together with the stately avenues of trees on the college campus, seemed to bid us welcome, and to impress the senses with the approach of a feast of intellect and a contest of thought. And the good people of Ann Arbor gave us receptions and entertainments worthy the fair fame of their beautiful city.

The address of the retiring President J. P. Lesley exhibited the results of mature thought, and was listened to with marked attention by an appreciative audience. From a multitude of good things we quote: "The age of romance in science is part of the forgotten past. The New World has grown grey-haired in fifty years, intolerant of the irresponsibility, the sportiveness, the poetry, the music, the superstitions, the affections of its youth; dealing only in hard facts, and in their causes and consequences; weighing and measuring all things; collating, comparing, and classifying; insisting upon investigation at all points; formulating rigid laws; scoffing at the unseen and unknowable; and transmitting the fear of God and the hope of heaven into a zeal for the exact determination of the units of force, and a confident expectation that railroads will soon traverse all the unoccupied regions of the earth, and malleable steel replace wood in the mechanic arts."

But Prof. Lesley originated an expression which will become classical—"dead-work." He said: "To describe dead-work is to narrate all those portions of our work which consume the most time, give the most trouble, require the greatest patience and endurance, and seem to produce the most insignificant results. It comprises the collection, collation, comparison and adjustment, the elimination, correction and re-selection, the calculation and representation—in a word, the first, second and third handling of our data in any branch of human learning—wholly perfunctory, preparatory, and mechanical, wholly tentative, experimental, and defensive,—without which it is dangerous to proceed a single stage into reasoning on the unknown, and futile to imagine that we can advance in science ourselves, or assist in its advancement in the world."

Section A was favored with a profound mathematical paper on "The effect upon the earth's velocity produced by small bodies passing near it," by Prof. H. A. Newton, president of the Association. This problem is one of great difficulty, and requires the highest mathematical skill in its solution. But it was solved completely. The master mind penetrated all hidden labyrinths in computation, and satisfied the most formidable equations. Prof. Newton demonstrated these theorems in gravitational astronomy:

"A. If a cylindrical stream of small bodies evenly distributed and all moving in the same direction with common velocity shall move past the earth, supposed to be in the axis of the cylinder, the small bodies by the law of universal gravitation shall communicate to the earth a velocity along the axis in each unit of time:

(1) That shall be proportional to the density of the group:

(2) That shall decrease as the velocity increases, varying very nearly inversely as the square of the velocity:

(3) That shall increase with the radius of the cylinder, and be proportional to the logarithm of that radius, measured by a unit that differs from the earth's radius by a small quantity which is a function of the velocity."—*Newton's Abstract.*

The professor then proved that if this cylindric meteoric stream had an infinite radius, the velocity imparted to the earth by its passage would be infinite; but if its radius be comparable with ordinary stellar distances then motion so communicated to the earth would not be large. It was then shown that the cylinder of meteors even if of infinite diameter, and moving with a velocity *greater* than that of the earth, there would result an exceedingly minute acceleration of the earth's motion! If, however, the velocity of the meteors was *less* than that of the earth, the effect on the motion of the earth, would depend on the absolute velocity of the bodies, an assumed extent of the stream, both producing a minute retardation, yet the "effect is much too small to be detected by observation."

It was likewise proven that impact of meteoroids on the Moon can only increase its motion by "an exceedingly minute fraction of the Moon's observed acceleration." The chief result of the investigation is that the siderial year will not be lengthened or shortened by impact or flight of small cosmical masses.

Prof. Wm. Harkness, U. S. N., then presented a technical paper on the "Flexure of transit instruments," and showed how difficult it is to eliminate errors, since solid metal instruments are elastic enough to affect the line of collimation.

Prof. G. W. Hough, Dearborn Observatory, Chicago, then described his new printing chronography, which prints minutes, seconds and hundredths of a second on paper scrolls, which next morning can be read off directly. The mechanism is driven by a storage battery of the Professor's own construction, having an electro-motive energy of six volts, and the whole thing was termed a "luxury" by the astronomer.

Prof. J. B. Webb next described a method he uses in transformation of polar co-ordinates.

And then came Prof. C. H. Rockwell, of Caroline Island eclipse fame, who gave us an elaborate explanation of the new astronomical instrument—the Almucantar. He placed on the black-board a series of observations on fundamental stars for latitude. These observations were of surprising accuracy considering the simplicity of the instrument which consists of a telescope furnished with circles, verniers and micrometer, all resting on a heavy base which floats in mercury. We scarcely know what Rockwell will do next; he is liable at any time to start on an expedition to the end of the world and even now is in the process of making up his mind to go to the Congo country to witness the total solar eclipse of August 28–9th, 1886.

A pleasing change was made at Ann Arbor, in that Sections A and B held alternate sessions, allowing the privilege of hearing discussions in both. In Section B, the proceedings were of great interest.

Prof. S. P. Langley during the last two years has made refined research with the bolometer on the infra-red portion of the spectrum of the sun. This close student peers into the innermost recesses of Nature and seeks the wave-lengths of that heat radiation sustaining life on the globe.

A drawing revealing immense extension to the sun's spectrum was shown, wherein the visible portion was represented by a band of colors two or three inches in length, while the invisible—as detected by the bolometer—extended seven or eight feet beyond; the Professor stating that if the light spectrum be drawn to any ordinary scale, then the heat spectrum would not fall within the room. Great questions are involved since the energy in the infra-red spectrum sustains life on the earth: and the inquiry was raised, are the wave-lengths of energy radiated from the earth the same as the wave-lengths received from the sun? Varied experiments were made at Alleghany Observatory, to answer the question, with the result that the wave-lengths of energy receding from the earth are twenty times longer than those received. It seems reasonable that in the near future physicists will find the reason why the temperature of the earth and its atmosphere is so much higher than that of outside space.

But, this addition to the hitherto known spectrum was only made possible by *perfect* rock salt prisms manufactured by Mr. J. A. Brashear, Pittsburg, Pa. The processes of their manufacture were explained by Mr. Brashear, who displayed elegant specimens, while recounting the troubles met with in preparing absolutely plain surfaces. And it is with these prisms of salt that Prof. Langley makes unheard of discoveries in the infra-red. We quote Mr. Brashear's exact language: "The work Prof. Langley has done with the bolometer and rock-salt prisms on the spectra of some sources of invisible radiation, and in the recognition of hitherto unmeasured wave-lengths is most important. Suffice to say that if we place the value of the now known spectrum equal to one, his researches have revealed three-fifths of it."

We were impressed with the beauty of Prof. Rouland's diffraction gratings now made only by Mr. Brashear, who had a number on exhibition. And since spectroscopy is of such value in modern physics, we, at the risk of taking too much time, desire to note in detail these triumphs of genius and skill. We insert Mr. Bashear's own language as follows:

"The smallest grating—one inch—contains about fifteen thousand lines, and is estimated to be as powerful as a battery of twelve prisms. We have seen fourteen lines between the two D lines, and both the D lines double. This, of course, is out of all comparison with any prism spectroscope. The gratings are tested with a viewing telescope and collimator of six and three fourths inches aperture and seven feet focal length, probably the most powerful spectroscope in the world. And all gratings must stand this test before they are passed. The screw of the ruling engine is perhaps the most perfect mechanism ever made as the error of the length is less than half a mean wave-length of light. Though one of the most prominent European theoretical opticians declared it to be impossible to make a concave grating to give a perfect spectrum, Prof. Rowland demonstrated that it could be done. And now the work of these concave gratings is known all over the scientific world, especially in spectrum photography. When Thollon and Angstrom show seven or eight lines between the H lines in their standard maps, photographs taken by the aid of the large concave gratings show a hundred or more. And where the maps show no lines beyond the H group, one thousand are shown in the photographs up to wave-length thirty-seven, and hundreds may be counted beyond."

Surely the sun is surrounded by an absorptive atmosphere, which bids fair to be proven to be made up of all elements in a gaseous form, and it Newton's spirit can behold the actions of man on the earth, his soul must be filled with admiration at the advance of studies in the spectrum; while Fraunhoffer would be filled with amazement when viewing the multitude of lines rendered visible in the diffraction spectra of suns and nebulæ, telegraphic signals from the solitudes of space spelling out the names of the constituent materials of the most distant incandescent bodies.

Mr. Brashear then made a magnificent spectrum on the ceiling of the University by simply holding a grating in the sunlight shining through a window.

Prof. E. L. Nichols,—University of Kansas,—then presented a paper describing an elaborate series of experiments made with a spectro-photometer. He projected a spectrum of the sky, and composed it with spectra derived from light reflected from substances supposed to be white, such as magnesium carbonate, calcium sulphate, etc. Curves of results were shown and the data appeared to teach that the spectrum of a clear blue sky differs but little from spectra of white light or rather of light reflected from white bodies. It seemed impossible to escape the conclusion that the blue color of the sky is not really due to an excess of blue rays, but to a tendency of the retina to sensitiveness to blue or violet light. An apparent discrepancy in results of spectroscopic study seems to have arisen between Professors Langley and Nichols, which must be explained by further investigation. The scientific world knows that Langley went above nearly half the mass of the air on Mt. Whitney, armed with the spectroscope. From his report as delivered to the Royal Institution,—Science vol. V. No. 121, page 442, we quote: "I think we already begin to see that it is, at any rate conceivable that we *may* have been hitherto under a delusion about the true color of the sun, though of course this is not proving that we have been so. And it will at any rate, I hope, be evident that here is a question raised which ought to be settled: for the blueness of the sun if proven, evidently effects our present knowledge in many ways, and will modify our present views in optics, in meteorology, and in numerous other things;—in optics, because we should find that white light is *not* the sum of the sun's radiations, but only by those dregs of them which have filtered down to us." And on page 449, in speaking of his experiments on Mt. Whitney in building up curves representing solar energy, Langley says: "These have grown out of all proportion at the blue end, as you see by the outer dotted curve, and now we have attained by actual measurement that evidence which we sought, and by thus reproducing the spectrum outside the atmosphere, and then recombining the colors of like methods to those you have seen on the screen, we finally get the true color of the sun, which tends, broadly speaking, to blue."

It will be interesting to learn what decision of the questions here raised will eventually be made. Valuable papers were also presented in Section B, by Professors Carhart, Mendenhall ond Dolbear on subjects pertaining to electricity, while Mr. Clayton thought he had detected a law of change in barometric pressure and temperature.

Of the great number of papers read

in Section C, we mention one, that of E. H. and A. H. Cowles and C. F. Mabrey on an electric furnace for reducing ores of Aluminium. Very likely this furnace will revolutionize metallurgy, and mankind will derive much benefit if this metal Aluminium can be cheapened in price by electrical reduction. The ore is placed in the furnace between the electrodes of a dynamo, and is melted by the intense heat of the broken current.

This Aluminium question opens up several important possibilities, and the imagination readily conceives of an Aluminium steamer skimming across the Atlantic with increased velocity rendered attainable by the greatly reduced weight. And by another flight, we can imagine an airship of this light metal, hurrying to Europe, above the clouds, completely ignoring the ocean wave.

The Section of Geology was replete with contributions to our knowledge of the earth, notably by Professors Alexander Winchell, Orton, Williams, Claypole, Worthen and N. H. Winchell.

The Association was well entertained in the evening by an illustrated lecture on the proposed Tehuantepec ship railroad. The gigantic undertaking was fully explained by projection of lantern slides, and the details made clear. An immense car truck is to be rolled out upon a pontoon. Water is admitted and the whole sinks to the bottom. The ship is then brought directly over the car, when pumps exhaust the pontoon allowing air to enter and raise the whole mechanism, car, ship and all. The trucks and its mighty load is then hauled upon the railroad, which consists of six rails, making a road bed nearly forty feet wide. A steamship can be taken out of the ocean and placed on the track in thirty minutes; three sixty-five ton locomotives are able to haul the car and ship, the whole length of the railroad 134 miles, with a velocity of fifteen miles per hour. Really we are living in eventful times,—Langley is telling us all about the sun, the Cowles are solving the problem of wresting Aluminium from its refractory compounds, while the commercial unrest of man is about to break the isthmian barrier that has so long retarded that auspicious day—which is surely coming—when the nations of the earth will be as one.

Prof. E. S. Morse is President-elect, and Buffalo, N. Y. the place of next meeting.

"THE CRADLE OF THE HUMAN RACE AT THE NORTH POLE."

In the REVIEW for August is an article copied from *The Dial* headed "The Quest for the Primeval Eden," intended as a criticism on Dr. Wm. F. Warren's new book entitled "Paradise Found—The Cradle of the Human Race at the North Pole." Its writer does so little justice to the work he undertakes to criticise that I may be pardoned for offering some observations of my own upon the subject.

It is quite conceivable that, according to scholarship, one person should see many important things in a learned and thoughtful treatise like Dr. Warren's which another does not. There has been a vast amount of learned ignorance shelved away in our libraries upon the subject of paleontology and kindred sciences which is absolutely detrimental to the advancement of true scholarship. Teachers of the ancient classics are too generally so muddled by the evil genius of misinterpretation that misunderstanding has become chronic with almost the whole tribe. Having been nourished in a barrel, their vision is bounded by what they are able to see through the bung-hole.

Dr. Warren's book will mean to the reader so much and no more than his familiarity with the general facts and truths of paleontology and its kindred sciences have prepared him to understand. Yet it may be an authentic voice upon the subject of which it treats. To be able to pass intelligent judgment upon it, one must be already well furnished with a broad and varied knowledge of the religious ideas of all the great nations of ancient and modern times—their myths, traditions, and folk-lore—so that he may be competent to compare and relate together the thousand facts bearing upon the solution of the question whether there was for the human race one primitive centre of distribution; and if so, where it was located.

Dr. Warren sets out with the now almost universally accepted doctrine "that the earth is a slowly cooling body." He says: "All authorities in this field hold and teach that the time was when the slowly solidifying planet was too hot to support any form of life; and that only at some particular time in the cooling process was there a temperature reached which was adapted to the necessities of living beings On what portion or the earth's surface, now," he asks, "would this temperature be first reached?" The answer is at once obvious—at the poles. "We asked the geologist this question," says the Doctor: "is the hypothesis of a primeval polar Eden admissible?" Looking at the slowly cooling earth he replies; 'Eden conditions have probably, at one time or another, been found everywhere upon the surface of the earth. Paradise may have been anywhere.' Looking at the cosmic environment, however, he adds,—'but while Paradise may have been anywhere, the *first* portions of the earth's surface sufficiently cool to present the conditions of Eden life were assuredly at the poles.'" Science, then, concedes so much in favor of our author's conclusion that the cradle of the human race was at the North Pole." Why at the North Pole rather than the South, he settles upon another class of facts which are of a more affirmative character.

In Part III. the author gives the testimony of prehistoric climatology, and of paleontological botany, zoology, anthropology, and ethnology, as declared by all the wonderful discoveries in these several departments of investigation, going to show, as affirmed over and over again, on the highest scientific authority, that "till a very recent period, geologically speaking, our earth enjoyed a warm and genial climate up to the very poles themselves; and that all its vegetation was everywhere evergreen, of much the same type as that which now prevails in the modern tropics." Moreover, the best authorities in the science of paleontological botany in Europe and America "have lately reached the conclusion that all the floral types and forms revealed in the oldest fossils of the earth originated in the region of the North Pole, and then spread first over the Northern, and then over the Southern Hemisphere, *proceeding from North to South*." Just as conclusive is the testimony that animal life has followed the law. To use Dr. Warren's own words: "From all the facts but one conclusion is possible; and that is that like as the Arctic Pole is the mother-region of all plants, so it is the mother-region of all animals,—the region where, in the beginning, God created every beast of the earth after his kind, and cattle after their kind; and this is the conclusion now reached and announced by all comparative zoologists who busy themselves with the problem of the origin and prehistoric distribution of the animal world. But to believe that Prof. Herr's *Miocene Arctic Continent* was the cradle of all faunal forms, and yet deny that it was also the cradle of the human race, is what few philosophical minds are likely long to do."

Dr. Warren's chapters on Ancient Cosmology and Mythical Geography are perhaps the most interesting and remarkable collection of testimonies in favor of his hypothesis of any in his book. He shows that according to the traditions of all the old nations of the world, Japanese, Chinese, East Aryans or Hindus, Iranians or Old Persians. Akkadians (including Assyrians and Babylonians), ancient Egyptians and ancient Greeks—the cradle of the human race, the Eden of mankind, was in the centre of the earth, and that in nearly every ancient literature we encounter the strange expression, "the Navel of the Earth," coupled with the primeval birth-place of man. This centre of outgoing life has also in all the cosmogonies its Atlas's Pillar, or axis of the world. "It is the the umbrella-staff of Burmese cosmology, the churning-stick of India's gods and demons. It is the Trunk of every cosmical Tree. It is the shadowless lance of Alexander; the Tortoise-piercing (earth-piercing) Arrow of the Mongolian Heaven-god; the Spear of Izanagi; the Hacha de Cobra on which the Heavens of the

Miztecs rested. It is the Cord which the ancient Vedic-bard saw stretched from one side of the universe to the other. Is it not the Psalmist's 'Line' of the Heavens which is 'gone out through' the very 'earth,' and on 'to the end of the world?' It is the Irminsul of the Germans, as expressly recognized by Grimm. It is the Tower of Kronos; it is Plato's Spindle of Necessity; it is the Azacol of the North African Sunis; it is the Ladder with the Seven Lamps in the rites of Mithra; it is the Talmudic Pillar which connects the Paradise Celestial and the Paradise Terrestrial."

This Eden of the race had also in all the cosmologies its Mount of the Gods, Mount Atlas, Olympus, Meru, Tien-Chan, Ila, Sineru, Ásgard, and the Aztec Culhuacan, all tell the same story; and all refer themselves by their traditions and religious observances, variously expressed, to a "happy and prosperous place," not in their own midst, but in a far-off land of sacred associations, where the "holy house of the gods" is situated,—a land "into the heart whereof man hath not penetrated;" a place underneath the "overshadowing world-tree," and beside the "full waters." "No description," says Dr. Warren, "could more perfectly identify the spot with the Artic Pole of ancient Asiatic mythology. Yet this testimony stands not alone; for in the fragment of another text we are told of a 'dwelling' which 'the gods created for' the first human beings—a dwelling in which they 'became great' and 'increased in numbers,' and the location of which is described in words exactly corresponding to those of Iranian, Indian, Chinese, Eddaic, and Aztec literature; namely, *in the centre of the earth.*"

When, with all these antecedent probabilities before us favoring the Northern origin of nations, we take into account the myths, traditions, and intimations of ancient history which with greater or less distinctness relate all the races of men to a Northern home, far back in the twilight of antiquity, there would seem to to be no escape from the conclusion of our author that the North Polar regions of the earth were the original abode of the ancestors of the human race.

It would be impossible in this monograph to give more than a mere hint—a simple touch or two—bearing upon the importance of Dr. Warren's book to the really earnest and truth seeking student of Ethnology. To understand its true value he must read it himself. It will prove to him a most invaluable key by means of which many mysteries may be unlocked, and the cobwebs of many vague and misleading interpretations of the ancient classics swept away.

THE SONG-NOTES OF THE PERIODICAL CICADA.

There are few more interesting subjects of study than the notes of insects and the different mechanisms by which they are produced. From the day when Aristotle discoursed upon them they have interested every observant entomologist. It is difficult to record them in musical symbols that can be reproduced on musical instruments, some of the more successful and interesting attempts in this direction having been made by Mr. S. H. Scudder. I have studied closely the notes of a number of species and have published some of the observations.*

In the notes of the true stridulators, more particularly, as to the common Tree Cricket and Katydids, I have been impressed with the variation both in the pitch and in the character of the note, dependent on the age of the specimen and the condition of the atmosphere whether as to moisture, density or temperature. Yet with similarity in these conditions the note of the same species will be constant and easily recognizable.

A few remarks upon *Cicada septendecim* will doubtless prove of interest since the species has this year occupied so much attention. I do not find that the notes have been anywhere very carefully described in detail; nor would I pretend to put them to musical scale. Writing seventeen years ago I described the notes in a general way as follows: "The general noise on approaching the infested woods, is a compromise between that of a distant threshing machine and a distant frog pond. That which they make when disturbed mimics a nest of young snakes or young birds under similar circumstances—a sort of scream. They can also produce a chirp somewhat like that of a cricket, and a very loud shrill screech, prolonged for fifteen or twenty seconds, and gradually increasing in force and then decreasing."†

There are three prevalent noises which, in their blending, go to make the general noise as described above. These are,—

First: That ordinarily known as a *Phar-r-r-r-aoh* note. This is the note most often heard during the early maturity of the males and especially from isolated males or from limited numbers. It is variable in pitch and volume according to the condition just mentioned as generally affecting insect melodists. Its duration averages from two to three seconds; and the *aoh* termination is a rather mournful lowering of the general pitch and is also somewhat variable in pitch, distinctness and duration. In a very clear atmosphere and at certain distances an individual note has often recalled that made at a distance by the whistling of a rapid train passing under a short tunnel. But when heard in sufficient proximity, the rolling nature of the note will undoubtedly remind most persons more of the croaking of certain frogs than of anything else. I have heard it so soft and low and so void of the *aoh* termination that it was the counterpart of that made by *Oecanthus Latipennis* Riley, late in Autumn and when shortened from age and debility of the stridulator.

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*3rd Rep. Ins. Mo. pps. 14, 153, 154; 4th do. p. 159; 6th do. pps. 150—169.

†1st Rep. Ins. Mo. 1868, p. 24.

Second: The loudest note and the one which is undoubtedly most identified with the species in the popular mind, is what may be called the "screech." This is the note described by Fitch as "represented by the letters *tsh–e–e–E–E–E–E–E–e–ou*, uttered continuously, and prolonged to a quarter or half a minute in length, loud and piercing in the ear, and its termination gradually lowered till the sound expires." Dr. Fitch errs as to the length of its duration, and I have also erred in the same direction unless indeed there is a still greater range than my subsequent observations would indicate.

Since this was written I have heard on two occasions this note prolonged to twenty seconds, but this is very abnormal, and I have no other evidence than the season (June 20) that it belonged to *C. septendecim.*

It is more probable, however, that our memories were at fault, for, as I have verified this year, this *shrill* ordinarily lasts from two to three seconds—though occasionally longer—and is repeated at intervals of every five seconds. This note is rarely made by solitary males or when but few are gathered together, but it is the prevailing note in the height of the season, and is made in unison, *i. e.*, the assembled males on a given tree, or within a given grove, are prompted to it simultaneously, so that its intensity becomes almost deafening at times. It is of the same nature as that made by the Dog day Cicada (*Cicada pruniosa* Say) and in its higher and louder soundings is not unlike the commoner shrill of that species, though by no means so continuous. It is what in the distance gives the threshing-machine sound; and it has often recalled that which I have heard in a saw-mill when a log is being cut cross-wise by a circular saw.

Third: There is what may be called the intermittent, chirping sound, which consists of a series of fifteen to thirty, but usually about twenty-two sharp notes sometimes double, lasting in the aggregate about five seconds. This sound is so much like that produced by the Barn or Chimney swallow (*Hirrundo erythrogastra*) that a description of one would answer fairly well for both. It resembles also, though clearer and of higher pitch, the note of *Microcentrus retinervis* (Burm) which I have likened to the slow turning of a child's wooden rattle, highly pitched.

The above notes are, so far as I have observed, of higher pitch though of less volume in the smaller *cassinii* form.

The other notes viz., that made when the insect is disturbed, and a not infrequent short cry that may be likened to that of a chick, are comparatively unimportant; but no one could do justice to the notes of this insect without describing the three peculiar sounds which I have attempted to describe above, and which are commingled in the woods where the species is at all common, though the undulatory screech is by far the most intense and most likely to be remembered.

[The paper concluded with a description of the mechanism by which these various notes are produced, and after referring to the elaborate works on this mechanism, of Reaumur, Rosel, Solier, Landois and others, agrees with the earlier authors in considering the notes stridulatory rather than vocal. Riley finds that Landois, one of the last writers, who reversed the previous conclusions and asserted the notes to be vocal and due to the metathoracic spiracles, was essentially wrong. The noise produced is not made as in the buzzing Diptera as Landois concluded, for, while the air passages act their part in modulating the vibrations, the source of the noise is found to be in the parchment-like and ribbed drums, a portion of which is made to vibrate with great rapidity by the strong V-shaped muscles located in the abdomen, and which have great muscular power so that, even after separation from the insect, when pressed with a point held in the hand, they produce such intense vibration that it may be likened to a galvanic shock.]

A FIRST-PRIZE ESSAY ON DISINFECTANTS.

So common has it become for inferior work to gain prizes that the best talent rarely now competes. Ignorant or dishonest judgment discourages all such laudable efforts. A case in point constitutes the subject of this article. But for the fact that this one is likely to do much harm to the general public, the best course to pursue toward it is silence. Unfortunately, the subject is a serious one, and becomes doubly serious when the facts all appear. The competing essays have been bound in book form, and the volume is being extensively advertised among the Druggists of the United States. A leading light in the Pharmaceutical world was one of the awarding judges. His high position is sufficient endorsement among the men for whom it is intended. The general public rely upon druggists for information upon this subject. They must prepare all disinfectants used throughout the country unless proprietary. If they imbibe false information, the whole nation must suffer. The splendid work of the committee on disinfectants of the National Board of Health will be almost nullified by this one volume, unless some warning voice is raised by the friends of sanitary science. Facts necessary to a clear appreciation of the subject are conspicuous by their absence from the article. In no place does the author make clear to his readers what disinfectants really are, how they are tested as to value, nor their relative powers. He makes no distinction between deodorizers and disinfectants, nor does he even hint at the all important distinction between spore-destroying and non-spore-destroying agents. He markedly contradicts himself a number of times: not alone because he fails to distinguish between the guesses of twenty years ago and the knowledge of to-day, but because he fails to see what his own words mean. Instead of attacking, he upholds the most vulgar superstitions. All disinfectants have some defects we must know in order to handle them understandingly. He nowhere shows the defects of the agents he recommends. The price of a disinfectant, while of little interest to the few rich, is the first consideration with the many poor. The author does not deign to give any light upon the question. The two essays given subordinate positions possessed the merit of accuracy. This is much more than can be said of his. Very much of value which he neglects, they present, and nothing of the least utility in his, but can be found in far better shape in each of them. The first condition of the award was to be scientific accuracy. In the public announcement of the decision this condition is unblushingly declared excluded. By what right or authority did they do this? If the judges were not scientific experts upon the subject they should have given place to men who were. We have definite knowledge in this branch of Sanitary Science and competent men substantially agree as to what is true and false, established and questionable. The second condition forbade unnecessary technical terms. The first prize essay is the only one using chemical names where there are distinct common ones, and it even introduces such medical terms as "zymotic." The second condition was as much disregarded as the first. On what grounds then were the prizes awarded? The third and last condition was that there should be "clear directions for the preparation and use of the disinfectant recommended." The committee evidently took this to mean that shot-gun formulae, such as belong to the barbarous stage of Sanitary Science was intended. Good disinfectants are few and simple. Their names and exact relative values with many others of their class were given in the papers already mentioned. In describing their properties, full and complete directions were made clear. The first prize paper was filled up with obsolete receipts and ancient notions of a bygone age. Had the prizes been offered for an essay on Chemistry, and the highest given to a man who ransacked the literature of alchemy for his matter, the blunder would have been precisely the same in kind. Every stipulated condition of the contest has been wofully violated. The following analysis of the leading features of the paper show its utter lack of value as a contribution to the literature of disinfectants.

"Disinfection is defined to be the destruction of the *poisons* of infectious and contagious diseases." (p. 37.) The poisons of such diseases are the ptomaines. Disinfection has nothing to do with these. It aims at destroying the *cause* of such diseases. He begins with a false definition.

"Fire, certain forms of combustion, or oxidation *alone* are capable of completely disinfecting a locality." (p. 37.) All organic solvents, superheated steam and albumen coagulators he has either forgotten or never knew.

"Disinfectants are of two kinds; natural and artificial." (p. 37.) His classification, like his definition is a blunder. All are natural and all artificial as we view them. A true dual classification would be into physical and chemical. Dry and moist heat find no place in his classification.

"By its (ozone's) formation and destruction a vast amount of *materies morbi* may be destroyed." (p. 38.) The destruction of putrescent matter by ozone or anything else deodorizes but does not necessarily disinfect.

"Pure air must be accepted as the most important disinfectant and preventative measure that we have." (p. 38.) Disease germs can be preserved for long periods of time in pure air retaining their virulence. Sufficient dilution renders them obnoxious. Ventilation is better than disinfection on this account. Pure air, as such, is not known to possess any disinfecting power.

"Second only to pure air is pure water." (p. 38.) Bacteria often make their home in pure water. How then can it be called a disinfectant? Otherwise pure water has been known to contain germs enough to cause an epidemic. Its currents can dilute them. The water cannot harm them. As a cleansing agent to wash them away it is invaluable. As a disinfectant to destroy them it is useless.

"I maintain that pure air and pure water are the most important disinfectants." (p. 39.) Competent judges will maintain that he does not know what a disinfectant is.

"The artificial or chemical disinfectants constitute an important division." (p. 39.) Are air, water and ozone not chemical? It would seem not, as he excludes them from this class.

"Bromine and iodine can be employed directly in the sick room. They are exposed in an open vessel at a slightly elevated temperature." (p. 40.) Who ever tries this trick can be employed directly in getting the undertaker to measure the patient for a coffin; for it will surely be needed if even half enough is volatilized to kill a vigorous germ. No volatile disinfectant is of any value unless used strong enough to destroy all life, and must be used in a moist atmosphere. The author by failing to qualify the truths he has stated of such agents, by these necessary facts renders his whole remarks thereon worthless. No one can employ them as he directs, and gain any good results.

"Heat and steam may be considered as a subdivision of their own among the volatile disinfectants." (p. 41.) It is certainly news to the world that heat is material and can be volatilized.

"The volatile oils. These are feeble disinfectants." (p. 42.) Many volatile oils, such as turpentine, occupy a far higher place as disinfectants than nine tenths of the articles he lauds. As aerial disinfectants they are valueless. As deodorants they are pretty good.

"It (mercuric chloride) is almost exclusively used by physicians and surgeons for cleaning their instruments." (p. 42.) In the most serious cases they are willing to destroy their instruments by this treatment. To say that it is almost exclusively used is to state what is not true. Corrosive sublimate destroys every instrument it touches unless speedily and thoroughly cleaned therefrom afterwards.

"It should be used in the proportion of one to one thousand." (p. 42.) It is just as efficient of one tenth this strength, and far less dangerous. Where no farther dilution is needed one in one hundred thousand has been found plenty where rapid destruction is not so important as thorough work.

"A solution of twice as strong as the foregoing can be used for the disinfection of the sputa and other discharges of cholera patients." (p. 42.) The greater the strength the quicker will it coagulate the albumen around nests of germs and thus act as a preserver instead of destroyer. Here again the author's ignorance appears. He did not know that his advice required supplementing to save it from doing positive harm. Such solutions for such purposes must contain, beside the mercuric chloride, some powerful oxidizer like permanganate of potash to eat away the albumen and let it attack the germs. He did not even seem to know that his aqueous solutions of this salt of mercury would change to calomel unless protected by some other chloride. As his lack of knowledge rendered his advice dangerous and worthless when treating of volatile agents so we discover it has a similar effect in dealing with solid ones. All things considered corrosive sublimate, properly handled, is our most efficient disinfectant. In spite of this fact the author gives it no marked prominence over common salt, quicklime and charcoal, articles perfectly valueless for this purpose. Biniodide of mercury, the most powferful disinfectant known, iodide of silver, nitrate of silver and osmic acid—all potent germ destroyers—he has not so much as mentioned. The sulphate and acetate of iron, quicklime, gypsum and charcoal, articles possessing not one particle of disinfecting power, he commends in their stead.

"Twenty-four ounces (of table salt) to a gallon of water, or a handful or so to a pail of water, are the best proportions for ordinary use." (p. 43.) And this from a man who insists upon putting two drachms of Mercuric chloride into a gallon of water for excretions and sputa. One grain has more germ destroying virtue than ten times this amount of salt. Yet he insists upon one hundred and twenty grains.

"As to whether this class (Carbolic Acid) deserves our attention at all is a question difficult for decision." (p. 45.) Copperas and table salt receive a paragraph apiece to laud their virtues as disinfectants while the whole phenol group must be extinguished with a doubt. Could anything be more refreshingly verdant? Carbolic acid is bad enough surely. Superstition has caused it to be overestimated. We now know its exact power. It stands far ahead of his whole list if we exclude Mercuric Chloride and the hypochlorites. It is perfectly worthless as an aerial disinfectant. He evidently knows nothing of its place as a disinfectant.

"This group includes the antiseptics, alcohol, etc. Among the prominent antiseptics are benzoic acid and benzoates, borates, as aluminium borate, etc., borax, boro-glycerides, formic acid, picric acid, pyrogallic acid, resorcin, salicylic acid, etc." (p. 45.) What does he mean by "antiseptics, alcohol, etc.?" He seems to think that alcohol is not an antiseptic. Did he fail to put these agents in the order of their power because he did not know enough? It looks like it. As with these, so with all others? their arrangement is a perfect chaos. Why class them as antiseptics and give far less efficient agents the dignified title of disinfectants The fact is, the man was utterly at sea without compass or rudder. He does not appear to know that antiseptics are disinfectants if strong enough to be used to disinfect or destroy infection and disinfectants are antiseptics if used to keep down sepsis.

"It is impossible to undertake to discuss their (benzoic acid, salicylic acid, etc.) relative value here." (p. 45.) Why not? Many of them are far more important than the majority of substances he has discussed. In fact, this is a common failing of his whole paper. It gives undue prominence to substances of the most trashy character passing with contemptuous neglect the very sheet-anchors of all true sanitarians. Chloride of lime, the queen of disinfectants, he passes by with six lines. Copperas receives a paragraph to itself. The last is no better than a magic sign.

"All that is required to *immediately* purify and sweeten a contaminated air supply, *however originated*, is to dip a cloth in the liquid (an aqueous solution of chloride of lead and salt) and hang it up in an apartment." (p. 43.) Is the man so ignorant that he for a moment can entertain such a belief? Better things would be expected from a boy of eight or any intelligent but illiterate domestic. Readers of this review may doubt the correctness of the quotation, but I assure them it is a verbatim transcription, unmodified by any context. That such arrant superstition should appear in any scientific paper, would be incredible, if our senses did not confirm it. That the paper containing it should be offered in competition for a prize is almost beyond credulity. That that paper should, in the nineteenth century, win a prize is marvelous! That honest, intelligent men could award it the first prize is, to say the least, miraculous! Can it be possible that the judges ever read the essay in the most cursory manner? Do they know that their decision will make them occupy a position the reverse of enviable, when an intelligent public puts its stamp upon their work? The notes of the paper occupy very nearly the same space as the article itself. They are thrown in without regard to value. Sixteen receipts are given, every one of which is of most questionable worth. Not one of them contains a reliable sporicide. To do the work of five cents' worth of chloride of lime, or a fraction of a cents' worth of corrosive sublimate, would take many dollars' worth of the best he has given.

EDITORIAL.

VIVISECTION.

It is a very amusing task to study the idiosyncracies of human nature as exhibited in communications to periodicals and newspapers. But the most astounding expressions of "crank" theories and views appear in the occasional pamphlet and the ubiquitous tract. One of the latter is thus noticed in *The Medical Press and Circular:*

> A lady who evidently feels very strongly on the subject of vivisection has recently gone to the expense and trouble of sending from abroad a circular addressed to "her" colleagues and fellow workers "for the benefit of the human race and animal emancipation." She did not confine her kind attention, however, to those, and those alone, or else she has been gravely misinformed as to our sentiments, and it may be to this we are indebted for our copy. This lady makes a startling though possibly not a novel proposition; she proposes the total abolition of vivisection on animals, and would substitute condemned criminals, whom she would solicit as free agents to offer their degraded bodies while still living for the advancement of science as some slight compensation to society for the wrong they have done her. Should they survive the experiments (a point the lady evidently entertains some very serious doubts upon) a free pardon would be their reward.
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> Anæsthetics would be allowed, but not encouraged. The author of the circular touches upon a vexed question when she advances that animals are at least as worthy of protection as men, because having no souls, their lives are doubly precious to them. This is more novel than her first suggestion, and takes some answering—we will not attempt it here. She harrows unnecessarily the feelings of the scientific students by depicting in glowing colours the disgust that would be felt and shown by the "fair pure girl," to whose hand he has dared to aspire, if only his revolting practices were brought to light. This is her argumentum ad hominem, and is calculated to act seriously as a deterrent to all but determined bachelors.
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> She holds up to merited opprobrium those operators whose names are published in the "book of infamy," which would seem to be a directory containing their names and addresses, and is anxious under the lex talionis to provide for their future unhappiness. The author, in her anxiety to wipe out what she characterizes as a "hideous blot" on our fair humanity, occasionally oversteps, like many of her fellows in England, the limits of both courtesy and justice. Looking upon suffering as a means of regeneration, she anathematizes those whose profession and pride it is to alleviate it and condemns its professors to unhappiness in this world and acute suffering in the next.

What a picture, this, of the average woman with a mission! It must not be supposed that the crude and ignorant suggestions, the silly vaporings, the comical gravity, of such female Knights of La Mancha, find no Sancho Panzas as listeners. No doubt a cause which appeals so strongly to the lap-dog interest is as well started into a career of glory and success as the famous colony of Borrioboolagha.

Seriously the lady in question is quite as sensible as the great body of anti-vivisectionists who rant and rave over the corpses of dogs and monkeys slain in the interest of anatomical and pathological science. Who can doubt the benefits derived from vivisection when the experiments of Ferrier, Koch, and others are so full of instruction and help to the medical and surgical practitioner? Through the aid of the great mass of facts which vivisection has given to science, the physicians of to-day have achieved their most notable triumphs over disease and death. The operations through which these facts were reached were not performed from cruelty and blood-thirstiness but from a most benevolent and commendable spirit—the desire to meet the enemy of "gods and men," death, with the best weapons, the greatest skill, the highest knowledge that may be achieved.

The people who raise the cry against vivisection overlook many other outrages performed on their beloved beasts. What right has man, for instance, to keep that noble animal, the horse, in captivity, to urge him to his task with lash and spur, to mutilate him with brand and crop? What right has he to make the bullock his slave, to slaughter him for food, to rob the young calf of his mother's milk? I doubt if one of these reformers would forego his or her juicy sirloin because the animal that furnished it was butchered,—even though well assured by a thousand examples that vegetables alone will sustain life.

As for the suggestion that condemned criminals supply the place now filled by dogs, monkeys and frogs in the dissecting room, *Knowledge* playfully observes:

> In another column will be found a paragraph taken from our contemporary, The Medical Press and Circular, and containing a suggestion which is perfectly charming in its simplicity. It emenates from a lady who is so gravely exercised on the subject of vivisection of the lower animals as to propose that physiological experiments on them should be absolutely and entirely put down by the strong arm of the law, and that condemned criminals (!) should be substituted for them by the experimenter. "One day," says the veracious American legend, "Billy come home holdin' a little mole by the tail wich some boy had cot and give him, and it was alive. Wen my sister see him she said, O, you crewel, crewel boy, thro it in the fire this minit!"

SENSE-ILLUSIONS.

Mr. R. A. Proctor, following the incentive given by Prof. LeConte's recent paper in the *North American Review*, discusses some illusions of the senses in *Knowledge* for July. Mr. Proctor's genius seems well-nigh universal and he seldom puts pen to paper without having something to say worth the saying. In the paper referred to he shows by a series of simple experiments how untrustworthy the senses are under novel or normal conditions. One would think, for instance, that the sense of touch, in those matters wherein it serves as the medium of apprehension, cannot be deceptive; yet if we cross the tips of the first and second digits, and touch objects with them thus crossed, it will be discovered that the sense of touch is not always reliable. Many other like experiments could be suggested. Several of these are used by conjurers, such as the following: Take a silver half dollar and, holding a companion's hand with the palm upward, press the edge of the coin strongly into the middle of his palm for a few seconds; if you then deftly remove the coin unperceived, at the same time closing his hand firmly, it will be difficult to convince him that the coin is not in his grasp. This is a very amusing "trick" and is frequently performed by the conjurer to the astonishment of his audience and the innocent youth victimized. To the same degree is it possible to confuse the sense of heat and cold. If one hand is placed in a basin of hot water and the other in a basin of ice-water, when both are withdrawn and plunged simultaneously into a basin of tepid water the "feelings" of the two hands give the lie to the assertion of sight that they are both in the same basin of water. The hand that was in the ice-water finds the tepid water quite warm while the hand that was in the hot water disputes this and declares it to be quite cold.

But the sense of sight is, perhaps, the most deceptive of them all ; notwithstanding popular notions on the subject. Every lawyer knows the impossibility of finding two witnesses of an event who tell the same story. Indeed this fact, the rarity of agreement between independent observers of events, has led to a distrust of witnesses who repeat the same story without variation or disagreement. In a recent magazine there is a picture of three men walking along a pavement. They are receding from us following each other. The one in front appears of gigantic size, the next somewhat smaller and the hindmost quite diminutive. It seems ridiculous to assert that there is no difference in their sizes yet they measure the same. The illusion consists in drawing the surroundings in proper perspective and abandoning perspective in depicting the figures.

Thus it is not a mark of superior wisdom to rely upon the verdicts of the senses indiscriminately. It might be justly suspected that many of the marvels that we are accustomed to hear testified about so volubly are merely " Illusions of the senses."

The subject of a public park for Kansas City will attain as much importance shortly as any other question of municipal progress. Any one who will drive to the ford on Brush creek, south of the city, and turn eastward down a wood-road for a few hundred yards, will reach as pretty a piece of sylvan scenery as may be found anywhere. There is a mimic water-fall, with crystal-clear water and unfailing spring. Rocks abound and quiet pools and shady trees. Below the little cataract is a bayou which could be easily given the aspect of a natural lake. Around are highlands and lowlands giving variety to the landsbape.

If it is not possible to get ground enough for a park on the river-front, (on the bluffs east of the city), at a fair valuation there is no spot around Kansas City more suitable than the one on Brush-creek.

"The Henry Electric Motor, of this city, of which so much was expected, is taking a rest in the torpid state. It was to be in practical operation for the Inter-State Fair, to be held next week, but as is always the case in such failures, the manufacturers of the special car required for the purpose failed to come to time, and now we are to have another interregnum in the date of the opening exhibition. The truth of the matter is that some of the projectors and stockholders are also interested in a new to-be-patented flying machine, and you know the old adage about having too many irons in the fire."

The above clipped from the *Eledtrical Review* is quite amusing as an evidence of the tendency of very wise men to be gulled by a cleverly written hoax. The Henry Electric Motor is not " torpid " and the flying-machine company was the creation of an enterprising and ingenious young man on the staff of a local newspaper. The same reporter has successfully palmed off several new stories of the same sort lately, including one on a perpetual motion machine and one on an air engine which is to pump its own air into the receiver. The Electric Railway Co. referred to has secured the switch of the Ft. S. & G. from the Rosedale road to the Fair Grounds and their new car will shortly be here and a final test made of Mr. Henry's invention.

The eighteenth annual meeting of the

Kansas Academy of Science will be held at Manhattan, Tuesday, Wednesday and Thursday, November 10th, 11th and 12th, 1885. The business meeting will be at 3:30 p. m. of the 10th, at the Agricultural College, where the day sessions of the Academy will be held.

The citizens of Manhattan offer to entertain at their homes those who prefer such entertainment, and reduced rates are secured for those who prefer to accept the accommodations of the hotels. Free carriages will be provided for the transportation of visiting members to and from the trains, and between the Town and College.

Those expecting to present papers are requested to announce their titles to the Secretary, at Manhattan, AT ONCE, in order that they may be properly ar-arranged in the programme.

The conclusion of "A Chinese Columbus" was crowded out this month but will appear in the November number.

It is to be hoped that patrons of the REVIEW will send in their subscriptions without further delay. We intend that the West shall have a first-class magazine but this intention must meet a more substantial appreciation than fine phrases and flattering testimonials.

The REVIEW intends shortly to commence a thorough and scientific investigation into the sources of water-supply for Kansas City; the facts and conclusions to be applicable to the general sciences of hydrostatics and hydrology as well as to the purpose of the special enquiry.

CORRESPONDENCE.

CHANGE IN THE NEBULA IN ANDROMEDA.

EDITORS KANSAS CITY REVIEW:

The phenomenon now taking place in the Andromeda nebula is being watched at this observatory with interest. It was first detected by Dr. E. Hartwig in Europe, and by W. H. Numsen in Baltimore, about Sept. 1st. It consists of a bright star-like nucleus in the centre of the great nebula, that has very recently developed. We observed this nebula on August 24th, and no trace of a nucleus was seen, but on Sept. 4th it was a conspicuous object. Three theories may be advanced concerning the apparition. It may be a new star that has formed on the farther side of the Nebula, and shines through it, or a new star on this side, or a new sun in process of condensation from the mass of the Nebula itself. The first two hypotheses are most improbable, while the latter is reasonable and seems in accord with what little we know regarding the sideral heavens, and their processes of evolution. If the Nebula is condensing into a sun, it is the most stupendous spectacle ever beheld by human eyes. It has been granted to man to witness creative action, and look upon the formation of a sun. The distance of the nebula is unknown, but in all probability, that ray of light which now enters our telescopes from this incandescent nucleus, has been on the flight hither for more than one thousand years, with a velocity of 186,000 miles each second. The nebula has a large angular diameter, hence, when we contemplate its distance we cannot fail being impressed with its real and mighty dimensions—hundreds of times greater than the expanse of the Neptunian orbit—and when this bulk of atoms combine and conduse into a liquid sun, the evolution of energy in the form of heat and light, takes place on a most magnificent scale. Yet so distant is the grand illumination that only a few rays reach the earth to be eagerly caught up by a spectroscope in the hands of some student seeking to learn what elements there are in an incandescent state. In 2,000 years from now it will be regarded as the star of 1885.

Edgar L. Larkin.
New Windsor, Ill., Sept. 22, '85.

TWO NEW CHEMICAL TERMS.

Editors Kansas City Review :

It is the general accepted theory among scientific men now-a-days that almost all matter, whether elementary or compound, exists in the molecular state. Whenever molecules are spoken of, they are commonly characterized as simple or elementary, and compound. Now it seems to me that *two new terms* are needed in chemical nomenclature for expressing clearly and concisely the distinction between molecules of simple substances and of compound substances. Such terms may exist but I have not seen them. The terms I propose to introduce may be in use but I have never met with them. They are formed on the analogy of homogeneous and hetereogeneous, viz : *homatomic* and *heteratomic*. As illustration, I would say the molecules of hydrogen are homatomic, but the molecules of water are heteratomic.

If these terms are unnecessary, or old, I would like to know from some good authority ; if new and useful as well would I like to know.

Prof. T. Berry Smith,
Pritchett Institute, Glasgow, Mo.

SCIENTIFIC AND INDUSTRIAL NOTES.

FORMATION OF COAL.

The American Cyclopedia admits that there is no generally accepted theory for the formation of mineral coal; and in confirmation, quotes six partially recognized theories and the arguments of their endorsers and advocates. It is in order, therefore, to offer for consideration theory No. 7, which proposes to demonstrate, analogically, to the satisfaction of at least one of your readers, that the great coal beds of Pennsylvania were formed by chemical action of the elements in solution and suspension in the water, and that these elements came direct from the interior of the earth by volcanic action.

The most popular scientists of the day agree upon the theory that "mineral coal is of vegetable origin," requiring millions of years to grow the vegetation, and a constant up and down tilting of the earth's crust, to grow it, and cover it up; and yet they have never agreed fully upon the mode, in detail, by which the series are repeated, time and again, in such uniformity. They ignore the true solution of the question, chemical analyses, and pin their faith upon the incidental deposits of fossils, as their guide to the age of these several formations. They generally agree, however, that the carboniferous age did not commence until after the deposit of the sedimentary formation, called by Rogers the Seral Conglomerate or Formation No. XII. of the Pennsylvania nomenclature; and that any traces of coal below the seral conglomerate are "abnormal," "sporadic" and "illegitimate."

Now, we do find good coal fields in the lower formation, in series of the same uniformity, and quite as free from impurities as the best seams in the carboniferous formation No. XIII. This is not theory but fact; hence the necessity for a new theory, to give this legitimate coal an honest parentage.

When we consider that all the elements found in the earth's crust originated either in the atmosphere or in the mass which forms the interior of the earth, we must certainly look to the interior magma for the most of the metallic bases of the rocks, including stone coal.

Neither hydrogen nor carbon are very abundant in the atmosphere; but they are abundant in the entire crust, as the volatile portion of the vast beds of coal, as petroleum, and in numerous gaseous forms, as natural gas and the fire damp of coal mines. The recognized series of hydro-carbons are numerous.

The chemists of the latter part of the eighteenth century have left their records of the discovery of the fact that metallic bases immersed in some of the hydro-carbons may be entirely surrounded by oxygen without oxidation, unless brought into atomic contact by agitation; and experiments within the past few months have demonstrated that metallic carbon may be heated in atomic contact with any oxygen, without combining, until moisture is introduced in some form.

The best authorities in chemistry recognize both hydrogen and carbon as metals; therefore, inorganic. Now, grant that these elements, in the form of hydro-carbons, have their origin in the interior magma; then by oxidation of the metallic bases we produce combustion and decomposition of the hydro-carbons, setting free the hydrogen to mingle with the oxygen of the atmosphere to form rain, while the carbon and oxygen will form carbonic acid, to be brought down from the atmosphere by the rain into the water on the face of the earth. Whenever the crust of the earth becomes thich enough to obstruct the free passage of these gases and other products of oxidation, combustion, condensation, and decomposition, paroxysmal and volcanic action will result, and the igneous mass resulting from said oxidation and combustion will be outpoured upon the surface to thicken the earth's crust. If poured out in the atmosphere to cool slowly, to form crystalline rocks; if injected from below into the water basins, to become disintegrated, the coarser portions to come down as conglomerate rock, while the finer parts will dissolve in the acidulated water or be held in suspension in the water as mud, to come down as chemical compounds, precipitates, and mud slates and shales.—Titus E. Emery in Coal Trade Journal.

ANCIENT METHOD OF WASHING GOLD.

The gypsies of the Banat in Austro-Hungary, in washing the gold from the sands of the rivers and plains, still use a very antiquated system, out of which no doubt the modern systems have grown. It is practiced now by the gypsies as it was by the Romans in the same country. It consists in nothing more than pouring the sand, mixed with water, over an inclined plane, the heavier particles of the gold remaining upon the surface, while the light impurities are washed away. Sometimes the inclined plane is covered with woolen cloth, to which the gold adheres; wanting the cloth, the gypsies now and then use for the same purpose the more ancient substitute of a fleece. The manner of collecting gold dust on sheep's fleeces upon inclined plains is represented in the curious old works of Agricola. In the rivers of Colchis, the custom is still retained of placing sheep skins in the beds of the Phasa and other auriferous streams to collect particles of gold, hence the dedication of such fleeces to the gods, and the fabulous history of the Argonauts, as far as it related to the Golden Fleece. The more common manipulation among the gypsies of the Banat, as far as the gold washing is concerned, is performed by means of a plank of a lime tree, six feet long and one and a half inches thick. At the upper extremity is a small trough, and across the board are about a dozen grooves or furrows cut in the wood. The plank is set at an angle of 45 degrees. The sand is put into the trough at the upper end, and thence, by plenty of water washed down the sloping board. The gold dust falls into the grooves, whence it is scraped or brushed off. It might be supposed that a great deal of gold is lost by the careless method, but long experience has made the gypsies very expert; they know how to distinguish the rich and poor sand, and a careful examination of the tailings proves that hardly a particle of gold escapes them during the operation. The gold is in the form of a fine dust, the sand containing it is mixed with black particles of highly magnetic iron, garnets and mica. —London Mining Journal.

THE CREEPING OF RAILS ON THE ST. LOUIS BRIDGE.

The rails forming the double line of railway over the St. Louis bridge move in the direction of the traffic at the rate of more than a foot a day. This creeping occurs only on the bridge proper (1600 feet in length and rising five feet from each abutment to the center), and on the eastern approach (2500 feet long, gradient 1 in 66, and consisting of short girders on iron columns). Various methods have been tried to keep the rails in place, but without success, and the practice is now to leave the rails to creep, cutting out and filling in as may be required at the butments and at the foot of the east approach. This has to be done many times a day at each place. In the twelve months ending August 1884, the rails of the north line traveled 400 and 401 feet respectively up the approach, and 268 and 260 feet respectively over the bridge, while the rails of the south line traveled 414 and 415 feet respectively down the approach, and 240 and 239 feet respectively over the bridge. The ratio of westward to eastward movement on the bridge is 1,099, and this is exactly the ratio of westward to eastward tonnage. On the approach this proportion does not hold, the result being affected by the heavy gradient. An analogous phenomenon is the creeping of bridges on their supports. If a bridge have its two ends similarly mounted, when a train comes upon it from the right this end is at once pinned fast by the weight of the train. The deflection caused by the train lengthens the bottom chord and shortens the top chord of the truss, so that if it is supported at the bottom chord, the left end moves to the left, and if at the top chord, the left end moves to the right. As the train passes off at the left end, this end of the truss is pinned fast while it recovers its shape, and consequently if the truss is supported at the bottom chord it will have moved bodily to the left, and if at the top chord to the right.

The author considers the various explanations already offered to account for the creeping of the rails, showing them to be either insufficient or unsatisfactory. His own explantion, the result of accurate observation, and supported by interesting experiments described in the paper, is that there is a wave-motion of the rail independent of its supports, such a wave occuring under each car and moving with it, giving a slight forward motion to the rail everytime a given section is brought down upon the support. The total movement for one train will thus vary with the number and weight of the cars. On the bridge, the rails (flat-bottomed) rest on pillow-blocks of gunwood 5½ inches thick, held in position between longitudinal channel-irons. These blocks are 17 inches long and spaced 19 inches apart end to end. The wave-motion of the rail is due to the elasticity of these supports. The rail is held fast on the supports by the load, on its extended side. This causes it to measure its length across pact way, the spare heat left from heating the cells being available for working the producer. Mr. Kendall proposes to employ it for a variety of purposes—for example, the driving of electric launches, and so on. With the new generator, all that is required to maintain the working is a supply of fuel and a little water. The inventor estimates that a ton of coke used in heating the battery, including the hydrogen producer, will give at least three times the electrical energy that would be produced by the same quantity of coke used in working a steam-engine and dynamo. It is also hoped by the inventor to develop the new process of electric generation for lighting purposes. Houses can in this way be lighted by incandescent lamps by means of coal-gas supplied to the premises; and larger centers illumination could be economically worked by the use of ordinary fuel, such as coal and coke.

THE NEW STAR IN ANDROMEDA.

The importance of the latest news gathered from the starry heavens has, apparently, been hardly comprehended, even by many of the astronomers themselves, remarks the New York Sun. To say that a new star has appeared among the countless brilliant specks of light that enliven the sky at night does not seem very startling, especially when the new star is so faint as to escape all eyes except those that are aided by the telescope. The news assumes greater interest, however, when it is considered that this new star is a sun, as large, probably, as our own sun, which has suddenly sprung into being in the depths of space, lighting up with its radiance a corner of the universe hitherto buried in the gloom of perpetual night.

But the most interesting fact about the new star in Andromeda is that it appears in the centre of a nebula, thus giving some countenance to the assertion which has been made that it is a marvelous example of the process of nebular evolution by which our own solar system is believed to have been produced. If this is so, however, we have here an instance in which the exceeding slowness of development assumed in the Nebular Hypothesis is replaced by a sudden bound from the nebulous to the solar condition. It appears that early in August certain observers saw a singularly bright spot in the Andromeda nebula which, however, was clearly a nebulous mass and not a star. In a month a star glittered in the place of the curdling fire-mist! Thus, if we believe that the new star really belongs to the Nebula of Andromeda, men have beheld the birth of a sun, not by gradual processes of contraction covering ages upon ages of time, but by a sudden spring into being, a burst of splendor in which the dull and scattered matter of a dimly glowing nebula has, almost in a twinkling, been transformed into a magnificently blazing sun, pouring the sudden light of day into the depths of space for millions of miles around it.

We can behold no spectacle on earth comparable with that. But a great deal of evidence will be required to convince astronomers that this is the actual history of what has occurred. They will probably sooner believe that the new star is the result of some collision of dark bodies in space, or of a terrific outburst of fiery forces in such a body lying between us and the Andromeda nebula, rather than that the step from nebula to sun could be so suddenly performed.

It is as yet all a great mystery, and the solution of it, whatever it may be, cannot fail to prove intensely interesting.

LABOR AND CAPITAL.

At the recent meeting of the American Institute of Mining Engineers in Halifax, President J. C. Bayles delivered a notable address on "The Existing Relations of Labor and Capital in the United States." Among other things Mr. Bayles said: "If the great problem of the improvement of the condition of the working classes is ever to be solved, we whose minds are trained to logical and purposeful thought, and who control the machinery of capital, must at least help solve it. For the idle and vicious there is nothing but the bitter fruits of idleness and vice. Those who break the inflexible laws of nature must expect to incur her inexorable penalties, and it would be a false and hurtful philanthrophy which should seek to avert them. But for industry and thrift there should be something better than our present industrial system gives. Arbitration should decide fairly and impartially the issues between workmen and employer, and some part of the profits of production should seek investment in ways which will react favorably upon the interests of labor. Participation should be established on an equal basis as the reward of faithful service, and co-operation should be promoted wherever and whenever it can benefit the wage earners. What may be our duty in these directions depends upon what may be our opportunity. There is, I fear, much of truth in the assumptions of the International Workingmen's Association that the laboring classes have nothing to hope for from the higher classes, but must fight out their own emancipation. If left to themselves they will undoubtedly fight to attain it; if intelligently aided and led they will work it out by peaceful and beneficent means. Such leadership and direction will come, if at all, from the men of education who are carrying on for capitalists or corporations the productive industries of the country. Each of us can contribute something to the solution of the great problem, and each may succeed in proportion to his opportunities in reducing the barrier which has been built up between the classes into which society is divided."

TELEGRAPHING TO AND FROM MOVING RAILWAY TRAINS.

The following details, from a late lecture on "Induction" by Mr. Frank Kitton, will serve to give a fair idea of the operation of the Phelps system of telegraphing to and from moving railway trains, which is now attracting attention.

In the first place, an insulated copper wire, suitably inclosed, is run along the railroad track midway between the rails. This may be called the secondary wire. Underneath the car, fitted with the necessary instruments, is placed an iron pipe (running the whole length of the car), in which is placed the primary wire, which passes first through the pipe, is then brought up into the car and strung along the top, after which it descends through the car into the pipe again, and so on, until the latter contains about ninety convolutions of wire, the ends or which are made to terminate in suitable telegraph apparatus. Every time, therefore, the telegraph operator in the car manipulates his key, he causes a strong current to flow in the wires contained in the pipe, which is placed at a distance of about 7 inches from, and parallel to the wire on the track. An induced current traverses the wire, which is led into the different offices, and is there connected with a similar set of apparatus. This apparatus receives the induced electric impulses and renders them intelligible to the receiving operator. The reverse of this is also true. When a dispatch is forwarded from any of the offices to the train, the currents traversing the wire between the rails are inductively taken up by the parallel wires under the moving car, and conveyed to the receiving instrument, to be there translated by the receiving operator.—Cin. Artizan.

THE AGE OF THE MOUNDS.

Dr. Cyrus Thomas, who is in charge of the division on mound exploration of the Bureau of Ethnology, has in the last three years obtained about 15,000 specimens of the handiwork of the mound builders, the study of which, with the survey of the mounds themselves and their surroundings, is gradually leading to a solution of certain archæologic riddles which a few years ago seemed unsolvable.

While some of the mounds are doubtless very ancient, others similar in character and equally interesting have certainly been built up since the advent of Europeans. A string of sleigh bells much corroded but still capable of tinkling, was found among the flint and bone implements in a mound in Tennessee, while in Mississippi, at the point where De Soto is supposed to have tarried, a Spanish coat of arms in silver, one blade

Edible earth is found in Bolivia, and one kind, which has an agreeable odor, is much esteemed by the Peruvians. The negroes of Jamaica have recourse to it when other food fails; on the other hand, the negroes of Guinea, transported to America, seek for an earth like what they are accustomed to, and in its absence they consume the white pie-clay, to the injury of their health. In the kingdom of Siam the women and children are earth-eaters; in Java (says Labillardiere) they make a sort of cake of ferruginous clay, which is eaten to produce leanness. It is an object of commerce in Anam and Tonquin. The usage is widespread, existing in Guina, New Caledonia, Siberia, Terra del Fuego, and some descendants of the old navigators in Portugal. The Indians of the Dutch colonies of Java and Sumatra make a peculiar preparation with edible earth, reducing it to a paste with water, spreading it into thin plates, morsels of which are grilled in a pan over a charcoal fire. These little slips, rolled up, are like dried barks of a warm gray or ruddy color. They also make roughly moulded figures like our gingerbread men and sweetmeats. M. Hekmeyer showed at Amsterdam, in 1883, specimens of edible earth in its natural state and prepared also a few little figures, imitations of fruits and fancy objects. The flavor of these delicacies is empyreumatic, and the mild, slightly aromatic sensation which follows the first taste arises from the earth itself, to which no condiment is added. The early origin of the custom of making various alimentary substances into human shapes is obscure--[Science Monthly.

A BLACK INVENTOR.

A recent issue of the Montgomery (Va.) Messenger contains the following:

Minnis Haden, a worthy colored blacksmith of this place, has lately invented one of the most ingenious and valuable devices we have ever seen. Being a poor man and unable to employ a hand as striker, he cast about how he might do by machinery what heretofore could be done only by the hand of man. The result of his cogitations is a piece of very simple machinery by which the striking hammer is easily and effectively worked by his foot, while he has both hands free to hold his iron and use the small hammer. To a listener the blows come as naturally and as rapidly as if there were two men handling the hammers in the old-fashioned way, but there is a difference. The machine, by an easy motion of the foot on the treadle, strikes a harder blow than any man can strike, and can be made at will to strike as light a blow as may be needed. But the use of this simple and cheap device in the blacksmith's shop is not half. It can be just as easily used, and will find a large field of usefulness, in driving a drill for blasting rock. In its present form, without any change, one man can drive a drill perpendicularly as easily as three men now do the same work. By a very simple and easy plan hammers can be provided and attached, which will make it just as easy to drive a hole horizontally or at any required angle, and the whole work can be done by one man. The machine is portable and need not be very heavy. Mr. D. W. Frizzell has become a part owner of this invention. A caveat has been secured, and Mr. Frizzell is expecting to receive a patent as soon as the papers are made out.

A MARVELOUS GOLD FIND IN MICHIGAN.

The recent gold discovery near Ishpeming, Mich., proves to be of marvelous richness—a veritable bonanza, vouched for by that reliable authority, the Marquette Mining Journal, the editor of which visited the "find" and publishes a detailed account thereof in the last issue. The vein is located on section 35, township 48, range 28, and has been explored about 800 feet. The first discovery was made June 14th, by W. L. Jones, an assayer of Ishpeming, but being on land owned by the Lake Superior Iron Company was kept quiet until terms could be made with the owners, failing in which the vein was traced to land adjacent, which has been leased by Mr. Jones and his friend. The richness of the vein was unknown until the second week of this month, when a single blast in a pit 6 feet in depth revealed a width of 4 feet of "sugar quartz," carrying free gold and assaying $20,000 per ton. The quartz is very brittle, crumbling easily under the pressure of the fingers. The Mining Journal's account says: "The rock is of wonderful richness, and it was the writer's privilege to secure from the vein, with the aid of a hammer and drill, a number of pieces carrying free gold. The quartz is well mineralized, and, unlike other gold bearing rock, carries very little silver, the gold being nearly pure The average value of the quartz cannot be accurately stated, but many specimens which have been taken from the opening described, would give an average of from $20,000 to $40,000, and even more, per ton; but this cannot be called the average value of the rock. That it will go up in the thousands is, from indications, beyond a reasonable doubt. With such a surface showing, the property may yet become more valuable even than is now thought by the most sanguine. It is certainly the richest thing yet found in the upper peninsula. The Nelson House 'lay out' of new specimens from the new find was duly examined and admired. It is, indeed, a magnificent showing of richly mineralized quartz, many of the pieces being thickly studded with virgin gold, which appears all through them in a variety of beautiful forms. Much has been said and written to prove that this region contains rich deposits of gold, but the best argument in support of this proposition—an unanswerable one, in truth—is to be found in this group of beautiful specimens, all of which were taken from a sinking in the vein less than six feet from the surface."

It is hardly necessary to add that the people of the upper peninsula are greatly excited over the discovery, and the prospecting now going on will likely develop other rich deposits.—The Age of Steel.

KENDALL'S ELECTRIC GENERATOR —A COAL BATTERY.

A report in the Engineer, states that at the International Inventions Exhibition, Mr. J. A. Kendall, of North Ormsby, Middlesborough, exhibits an electric battery, which appears to be a decided step in the direction of producing electricity from the oxidation of coal without the intervention of a steam-engine. The battery is based upon the well-known phenomenon of hydrogen passing through platinum at a red heat, two platinum plates being used as the poles, one exposed to hydrogen and the other to oxygen. These plates are arranged in the form of concentric tubes closed at one end, and are separated by a fluid medium of fused glass. Hydrogen gas is continuously supplied to the inner platinum tube, while the entire apparatus is maintained at a high temperature by means of a furnace fed with coke or liquid or gaseous fuel. The absorption of hydrogen by the platinum is accompanied by electric generation, and the current is led away by wires connected with the platinum tubes. It is curious, however, that, so long as the two platinum tubes are not connected by a metalic circuit, the passage of the hydrogen is slow, but that, as soon as the electric circuit is completed, the rate of flow is suddenly increased and is steadily maintained at the higher amount. In the case of a group of cells or battery, the same gas-furnace may be used to heat the series. The cells are connected for quantity and intensity as in the voltaic battery. The electro-motive force of a cell is given by Mr. Kendall, as about 0·7 volt. This is of course, much less than the theoretical electro-motive force of a hydrogen and oxygen couple, and the remaining energy evolved by the combination appears to be developed in the form of heat at the surface of the oxygen plate, and serves to keep up the temperature of the apparatus. In the action of the battery, the hydrogen in passing through the inner tube is, so to speak, filtered off from any gases with which it may be mixed. The residual combustible gases, if any, when drawn off by the escape jet, can be utilized as fuel for the furnace. This is a very valuable feature, as it enables the battery to be worked with Strong-producer gas, consisting mainly of hydrogen and carbonic oxide, and to be arranged in a very com-the bridge on its extended side, or it may be said to roll itself across the bridge on its extended side. If, instead of being supported at the bottom flange, the rail were supported at a point above the neutral axis, there will be a tendency for it to creep backward, that is, against the direction of the traffic, owing to the compression of the upper side. There would, however, also be a tendency for it to move foward, as the neutral axis when thrown into waves is longer than when at rest. Again, if the rail were supported from the upper surface, the creeping would be backward. There is, therefore, between the neutral axis and the upper surface of the rail, a line along which, if the rail were supported, there would be no tendency to creep either forward or backward.—[T. B. Johnson in Journal of the Association of Engineering Societies.

WHERE TORNADOES MOST ABOUND.

Sergeant Finley's elaborate and valuable report on the tornadoes of 1884, recently issued by the Signal Service Bureau, illustrates with charts the fact that these startling and destructive phenomena, like most hail and thunder storms, occur in places lying southeastward of a large barometric depression or "low center." The observations which form the basis of this report, says the New York Tribune, confirm various previously accepted theories regarding tornadoes, such as their occurence mainly in the afternoon, their generation by the conflicting polar and equatorial air currents, and the development of considerable electricity in connection with them. But the discovery just mentioned is of more practical service than any of the other facts brought out in indicating the possible outbreak of tornadoes in a given region. Inasmuch as these storms occur anywhere from 200 to 800 miles from the low center, a large area may be imperiled at one time, and the suddenness of formation, the narrowness of track and the brevity of the period of havoc make it impossible to foretell precisely in what localities within this broad region the outbreaks will occur; nor can any one say definitely how plentiful a brood of destroyers will be hatched, though the conditions favorable to their birth are distinctly recognized. Yet the importance of even the slightest valid warning will be appreciated when it is known that in a single tornado season of a few months over 1000 lives may be lost, 2500 persons injured, and property valued at over $13,000,000 destroyed. Such at least was the case last year; the destruction wrought in one day, September 9, being estimated at $4,000,000.

Sergeant Finley's tables show that the south suffered to an exceptional degree from this cause in 1884. Georgia, Alabama, and the two Carolinas were visited by one-half of the 180 tornadoes reported from the whole country. That particular district is more liable to such visitations than many other parts of the Union, but not so much so, on an average, as another tract embracing most of Kansas and portions of Missouri, Nebraska, Minnesota, Iowa, Illinois and Indiana, which, together, experienced only thirty-five last year. A schedule once prepared by Sergeant Finley, who has long been studying this subject, showed the distribution of tornadoes for the five years ending with 1880. This gave the four States first named 8.5 per cent. of the whole number, and 28.7 per cent. to the other seven. Another tabulation made by the signal service, including about 600 tornadoes, and covering eighty-seven years, still further established the fact that the northwestern tract already described is the chief sufferer from these afflictions; and the eastern cotton States come second. Texas is the region of next greatest frequency.

No theory is contained in Sergeant Finley's report to explain this exceptional prevalence of tornadoes in the south last year. An analysis of the returns, however, shows that a large proportion of last year's crop was produced in the spring season, while yet the low centers, which at intervals of several days are forever crossing the country in an easterly or northwesterly direction, were taking a somewhat more southerly course than in the summer months—usually the period of greatest frequency.

Thus, more tornadoes occurred in February last year than in July; although they were confined to two days in the former month, and distributed among fifteen in the latter. The tornado season this year did not fairly open until May; the greatest abundance was produced in June and July, when the low centers, mostly born in the middle plateau of the Rocky Mountains, were traveling along or north of the line of the great lakes; and a great majority of the attendant tornadoes have been experienced in the northwestern area already indicated as most liable to be thus visited. Still, without extending one's observation beyond these two years, it would be hasty to assume that the distribution of tornadoes any year depends upon the time at which the season opens.—Jour. of Com.

THE LONGEST BRIDGES IN THE WORLD.

The Moniteur Industrial gives the following as a list of the twenty-six largest bridges in world:

	Feet.
Montreal bridge, over the St. Lawrence	8789
Brooklyn, over the East river	5989
Rapperswyl, Lake Zurich	5333
Volga, over the Sysran, Russia	4947
Moerdyk. Holland	4927
Dneiper, near Jekaterinoslaw, Russia	4213
Kiew, over the Dneiper	3607
Barrage bridge, Delta of the Nile	3353
"Kronprinz Rudolph," over the Danube, at Vienna	3266
Dneiper, near Krementchough, Russia	3250
Bommel, over the Meuse, Holland	3060
Two Bridges of Rotterdam, over the Meuse.	2833
Mississippi bridge	2588
St. Louis, over the Mississippi	2574
Saint Esprit, over the Rhone, France	2460
Kinlinbourg, over the Rhine, Holland	2347
Cincinnati, over the Ohio	2233
Chaumont Viaduct, Valley of the Suize, France	2000
Menai, England	1957
Cubzac, over the Dordogne	1817
Varsovie, over the Vistula	1693
Iron bridge, at Bordeaux, over the Garonne	1667
Stone bridge, at Bordeaux, over the Garonne	1623
Beaucaire, over the Rhone	1460
Tours, over the Loire	1457
Alexandre, at St. Petersburg	1350

Of the above the sixth on the list has recently been opened, the Rapperswyl bridge is merely a pile structure and is only thirteen feet wide; the Sysran bridge over the Volga carries the Orenbourg railway, and was only finished in 1880; it has thirteen spans, and is raised 130 feet above the level of the river; it cost 13,500,000 francs.

The Moerdyk bridge carries the Anvers and Rotterdam railways over the Meuse, which is about 8,800 feet wide at this point, and has been reduced by dykes; it has fourteen spans of 328 feet each. It was commenced in 1868 and finished in 1871; it cost about 12,000,000 francs.

The above list is given as printed, but the compiler in the Moniteur has in his table wholly ignored many longAmerican bridges. A complete list of the length of modern iron bridges is not just now accessible, but among the omissions may be noted:

	Feet.
B. & O. bridge, at Havre de Grace	6000
Wooden bridge at Columbia, Pa	5366
Louisville railroad bridge, over the Ohio	5218
Cincinnati Southern railroad bridge, over the Ohio	3950
Havre de Grace bridge, over the Susquehanna	3271
Dauphin bridge, over the Susquehanna	3590
Monongahela bridge, near Homestead	3000
Plattsmouth bridge, over the Missouri	3000
Quincy bridge, over Mississippi	2857
Omaha bridge, over Missouri	2750
Keokuk, Ia., bridge, over Mississippi	2008
La Crosse bridge, over Mississippi	1672
Boonville bridge, over Missouri.	1651

To the above many other long bridges could doubtless be added, were the data at hand. The longest bridge in the world was the late Tay bridge which was 10,320 feet in length, and the Forth bridge now under construction is to be about 9,200 feet long. Although it does not strictly belong to the class in question, the New York elevated railway is a continuous iron truss bridge, and the aggregate length is thirty miles—Journal of Commerce.

EDIBLE EARTH.

Clay is composed of silica, alumina and water, colored by metallic oxides. Some samples of edible earth are composed as tripoli is, of innumerable microscopic and fossilized shells of fresh-water infusoria. How men came to have recourse to such aliment may be without evidence; but similar circumstances have led to like results in countries remote from each other. The Otomacs, a people of Southern America, take regularly a pound or more per day of a rich clay which appeases hunger without injury. Among the Indians on the border of the Amazon clay forms a part of their food, even when other aliments abound.

of a pair of scissors and other articles of European manufacture were found in positions which indicated that they were buried by the original builders of the mounds.

In a Georgia mound two copper plates were found, upon which were stamped figures resembling the sculptures upon the Central American ruins The workmanship is vastly superior to that displayed upon the articles of pottery, stone and bone found in the mounds, and their origin and purpose are not yet explainable. Aside from these plates nothing has been found to indicate a connection between the mound builders and the Aztecs or the Pueblos, while on the other hand, there are many reasons for not going beyond the Cherokees and their fellow red men of the Ohio and Mississippi valley to find the origin of these curious erections.

The purpose of the mounds still remains in some cases a mystery, but in others they are known to have been made sometimes for burial places, and sometimes as foundations for Indian villages, secure from the floods to which the low lands were periodically subjected.—[Norristown Herald.

VIVISECTION OF DOGS.

A large number of dogs have lately been, and are still being cut up by some of the professors of surgery in Bellevue Hospital, New York, in a series of trials intended to demonstrate the feasibility of certain operations upon human beings. Nearly all of the persons shot or stabbed in New York are taken to Bellevue. In cases wherein the abdomen is perforated death usually results from peritonitis, or inflammation of the membrane which lines the abdominal cavity. In various diseases, too, peritonitis is the fatal climax. Surgeon T. Herring Burchard, chief operator in the emergency ward of this hospital, and lecturer in the clinics of Bellevue Medical College, has held a theory that the mortality from this cause is needlessly high, and that many lives might be saved by the bold surgery of cutting open the body, removing the irritant matter, or even excising gangrenous portions of the bowels, and then trusting to antiseptic treatment for a recovery. He urged that whenever the dreaded inflammation became established to an extent rendering death nearly certain if nothing were done, then the knife ought always to be plied. This was a new and rather startling view even in these days of bold surgery. It was decided to experiment extensively with dogs. These could be obtained in any desired numbers from the public pound. The work was begun last spring, and has proceeded steadily ever since. Over 100 dogs have already been used by Dr. Herring and others interested in the subject. They have suffered the laying open of their abdomens and the removal of sections of intestine to see if they would recover. In a fair number of instances they have done so. The practice is defended on the ground that, could the operation be found practicable in human beings, a great number of lives would be saved by it. Especially would that be true in wars.

METEOROLOGY OF SEPTEMBER.

Prof. Snow, of Lawrence University, furnishes his monthly weather report for September, from which the following is excerpted:

The entire absence of frost, which characterized this month, is not an exceptional feature for September in Kansas. Nine of the eighteen Septembers of our record have been equally favored. The average date of the first autumn "hoar frost" is October 1st, and of the first "killing" frost October 20th. The mean temperature of the month just closed was below the average. The rainfall was almost double the average, and nearly the whole of it occurred during the first week. The wind-velocity was twenty per cent. below the average, and the cloudiness was nearly normal.

MEAN TEMPERATURE—65.43 degrees, which is 0.99 deg. below the September mean. The highest temperature was 86 deg., on the 24; the lowest was 49 deg., on the 2d, giving a range of 39 deg. Mean temperature at 7 a. m., 59.43 deg.; at 2 p. m., 74.28 deg.; at 9 p. m., 64 00 deg.

RAINFALL—5.41 inches, which is 1.97 inches above the September mean. Rain fell on 8 days. There were 4 thunder showers. The entire rainfall for the 9 months of 1885 now completed has been 30.95 inches, which is 2.26 inches above the average for the same months in the preceding 17 years.

Mean Cloudiness—41 per cent. of the sky, the month being 0.31 per cent. cloudier than usual. Number of clear days (less than one-third cloudy) 18; half-clear (from one to two-thirds cloudy) 2; cloudy (more than two-thirds) 10. There were nine entirely clear days and four entirely cloudy. Mean cloudiness at 7 a. m., 43.34 per cent.; at 2 p. m., 41.67 per cent.; at 9 p. m., 38 per cent.

Wind—S.E., 30 times; S. W., 24 times; N. E., 16 times; N., 8 times; S., 5 times; N. W., 4 times; E., twice; W., once. The total run of the wind was 8,611 miles. which is 2,140 miles below the the September mean. This gives a mean daily velocity of 287 miles and a mean hour velocity of 11.96 miles. The highest velocity was 43 miles an hour, on the 12 th, from 3 to 4 p. m.

Barometer—Mean for the month, 29.084 inches; at 7 a. m., 29,100 inches; at 2 p .m., 29.074 inches; at 9 p. m., 29.079 inches; maximum, 29.375 inches, on the 18th minimum, 28.731 inches, on the 7th; monthly range. 0.644 inch.

Relative Humidity—Mean for the month, 73.8; at 7 a. m., 85.5; at 2 p. m., 53.7; at 9 p. m., 81.8; greatest, 100, on the 6th and 7th; least, 8, on the 26. There were two fogs.

A valuable table showing the meteorological history of this month for seventeen years is added.

ASTRONOMICAL NEWS.

ASTEROID PALISA (250).

On September 4 a cable message was received at Harvard College Observatory, from Dr. Krueger, at Kiel, announcing the discovery of an asteroid by Dr. Palisa.

September 3.4120 Gr. M. T. R. A. 23h. 34m. 39.9s. Decl. —16° 9m. 35s.

Motion in R. A. —48s., Decl. S. 4m. 11th magnitude.

ELEMENTS AND EPHEMERIS OF COMET BROOKS, 1885.

The position of the comet, published in Circular No. 59, as secured at Harvard College Observatory on September 2, was, as stated, merely approximate. An accurate reduction of the observations is given below, together with Harvard positions on September 3 and 6.

September 2d, 13h. 53m. 6s. Gr. M. T. R. A. 13h. 42m. 28.24s. Decl. +36° 38m. 2.5s. Observer, Pickering.

September 3d, 13h. 10m. 59s. Gr. M. T. R. A. 13h. 47m. 43. 39s. Decl. +37° 6m. 13.8s. Observer, Wendell.

September 6th, 13h. 25m. 25s. Gr. M. T. R. A. 14h. 4m. 3617s. Decl. +38° 28m. 33.5s. Observer, Wendell.

From these positions the following orbit has been computed by Messrs. Chandler and Wendell:

ELEMENTS.

Time Perihelion Passage = August 17.75 Gr. M. T.
° m.
Longitude Perihelion = 265 33
Longitude Node = 200 34 } Mean Eq. 1885.0
Inclination = 54 05
Perihelion Distance = .7544

It was not intended at first to publish this orbit, it being a rough approximation, and the data somewhat limited but the weather being generally cloudy, with no immediate prospect of further observation, it has been deemed best to make use of it for a finding ephemeris.

EPHEMERIS.

Gr. Midnight.	—R.A— h.	m.	s.	—Decl.— °	m	Log. r.	Log.	Light.
Sept. 7	14	10	14	+38	53.4	9.9329	9.9546	1.02
11	14	35	58	40	29.3	9.9521	9.9329	1.04
15	15	5	9	41	47.4	9.9723	9.9116	1.04
19	15	37	57	+42	38.4	9.9931	9.8918	1.04

Light on September 2 taken as unity.

CAN UNDERGROUND HEAT BE UTILIZED?

In an article by J. Starkie Gardiner, in the Geological Magazine for September, the above subject is presented with much novelty and interest. After describing the phenomena which prove that the earth's periphery is only a crust of solid matter floating on a molten mass, he asserts that this crust is more likely to be ten than fifty miles thick. He refers to the artesian well now being bored at Pesch, which has reached a depth of 951 meters, and states that the temperature of its water is now 161 degrees Fah., and that the boring will continue till a temperature of 178 degrees is reached. The obvious deduction is that the heat of the earth will ultimately be utilized by man in the place of costly fuel and furnaces. "It needs no seer," he says, "to pierce the not distant future, when we shall be driven to every expedient to discover modes of obtaining heat without the combustion of fuel, and the, perhaps, far remote future when we shall bore shafts down to the liquid layer and conduct our smelting operations at the pit's mouth."

INFLUENCE OF FORESTS.

Prof. Muttrich, of Berlin, has reached the following conclusion from his forest meteorological researches: 1. That the forest exercises a positive influence on the temperature of the air; 2, that the daily variations of temperature are lessened by the forest, and in summer more than in winter; 3, that the influence of the leafy forest is in summer greater than that of the pine forest, while in winter the tempering influence of the pine forest preponderates over that of the defoliated forest. An attempt to determine the influence of the forest on the mean annual temperature led to no sure results.

The correspondent of the London Times, in Rome, writing from that city recently, says: "Au interesting discovery illustrating the commerce and the luxury of ancient Rome has been made close to Monte Testaccio and the English cemetery. The whole of that district to the west of the Aventine, outside the Porta Tregemina, was occupied by granaries and warehouses for the storage of imports of all kinds. Between the northern side of Monte Testaccio and the Tiber there still exist colossal remains of the great emporium built by Marcus Emilius Lepidus and Emilius Paulus, nearly 200 years before the Christian era. In the year 1868, a considerable portion of the quays was discovered, together with some 600 blocks, many of them of large size, of rare variegated marbles of all kinds, lying just where they were landed from the galleys which had brought them from Numidia, the Grecian islands and Asia Minor fifteen centuries ago. Now, in the course of the building operations in this locality, two warehouses have been discovered, one filled with elephants' tusks and the other with lentils. It is curious to find such products stored side by side, but as bags of lentils were sometimes shipped as ballast they may have served that purpose. The discovery would have been a very valuable one, if unfortunately, the ivory had not been much decayed."

A contributor to Cosmos suggests a curious optical experiment which may serve to show the principle of the telescope. If we cut out of black paper two similar figures—two crosses, for example—and place them, their extremities almost touching, at about three inches from the eyes, before a sheet of white paper, we shall see three crosses, the middle one being dark and completely separate. This phenomenon is explained by the simultaneous vision of the two eyes, and it is easy to show this by looking at the objects successively with one eye. The experiment becomes still more interesting when, instead of black figures, we employ complementary colors—red and green, for example. In this case we must use a dark background, and there will appear a white cross in the middle.

It has long been well understood that gold is the most universally distributed of metals, being found in all parts of the world, but most readers will probably be surprised at a statement recently made by Prof. A. E. Foote, of this city, to the effect that there is more gold in the clay under the city of Philadelphia, than would equal the entire valuation of the city. In 1812, men made sixty cents a day in washing the sands near Chester, on the Delaware river, where William Penn first landed, and quite recently several dollars' worth of gold in grains were taken from a well one hundred and fifty feet deep within twenty miles of Philadelphia.—Wood and Steel.

Experiments have lately been made with a diamond of 92 carats, which is one of the finest known outside of the royal or national collections. It is of wonderfully pure water, and is admirably cut with 64 perfect geometrical facets. Its value is estimated at $60,000. When exposed during an hour to the rays of the sun, it preserved for more than twenty minutes, in a dark chamber, a light sufficient to show the white paper that reflected its rays. The same phenomenon was exhibited, with somewhat less intensity, after having submitted the diamond to a powerful electric light. A very apparent phosphorescence was also produced by rubbing the diamond for a few moments with flannel.

Some quaint and queer mineralogical specimens were shown us by J. F. Brooks, of Tabernacle district. They were rocks, completely honey-combed with flinty cells of four sides, and gradually enlarging toward the surface. The flinty walls suggest the separation of the flinty from the lime or clay particles by crystallization. Some of the cells are filled with clay rocks. They were found by hoe and plow hands near the surface of the ground. The peculiar formation of the shell also suggests the possibility of their once having been the habitation of animalculæ akin, probably, to the coral builders. Who can solve the mystery? —Savannah News.

According to a paper read before the Philosophical Society, of Glasgow, by Mr. A. Willsamson, the total area of the coal fields of China proper is about 400,000 square miles. Both the Shansi and Heenan coal field are greater than that of the aggregate of the principal coal producing countries of Europe, and in other districts of North China the coal fields are said to be seven times larger than all those of Great Britain. The coal is of various descriptions, and it is said that iron ores are found in all parts in close proximity to the coal.

It ought to be generally known that a man's hat will serve in most cases as a temporary life preserver to those in danger of drowning. When a person finds himself in the water he should lay hold of his hat between his hands, keeping the crown close uner his chin and the mouth of the hat under water. The quantity of air contained in the cavity of the hat will keep the head above water for a long time—sometimes for several hours.

A relic of the great forests which once covered the south of Sweden was recently dug out of a bog at Kinneved, in the shape of a boat six feet in diameter, hollowed out of a log. The tree from which it was obtained must have been twenty feet in circumference. The wood, which was blue in color, was very hard, and the boat so heavy that two bullocks could not move it.

A sheet of ordinary paper warmed in front of a fire will, in a dark place, give a very decided electric spark upon the application of the knuckle, with a crackling sound. Place a sheet of gold leaf between two sheets of paper thus electrified, and pass a pencil point over them in a zigzag course, and a luminous flash, quite strong, will appear.

The new metal, "gallium," melts at 81.1 degrees Fahrenheit, becoming liquid when held in the hand. Its specific gravity is a little less than six, or about half that of lead. It adheres readily to glass when fused and forms a beautiful mirror. It tarnishes but slightly in the air.

French engineers have succeeded in finding water in the desert country of southern Tunis. At the depth of more than 300 feet they struck a current which rushed forth from the surface with such velocity as to carry hugh stones high into the air.

The manufacture of artificial ivory from bones and scraps of sheepskin is a new industry.

MISCELLANY.

PIGMY ANIMALS.

"How is that for an elephant?" said an artist, taking a green cloth from a clay model of an elephant about twelve inches in length. "Yes. it is small," he continued, "but that's just the great point in its favor. See this bone," he continued, taking up a small object from a table—"the real bone of the elephant I am making a model of. It was the famous recently discovered pigmy elephant of Europe. Some months ago a party of French geologists, rambling through Italy, came upon great quantities of these bones, and soon identified them as those of a race of elephants that were pocket editions, so to speak. The largest were not as large as our sheep, and in the adult form, old age, much smaller than any of the baby elephants that have been exhibited in this country. Their young in turn were elephants in miniature, being about as large as a small cat, and could easily have been held upon the open palm. Herds of these pigmies were undoubtedly captured by early man, and if the circus was in existence then, we can imagine a rare entertainment. What a troupe of elephants could have been marshalled in! First would appear the great Mammoth, with its long coat of hair; then the Dinotherium, with its incurved tusks; the gigantic Gangesa, from India, with its head and enormous tusks, extending fourteen feet in front, and finally, last but not least, the pigmies and their young arousing the enthusiam of the throng of young cave-dwellers.

"The pigmies, as far as known, represented two distinct species, known to science as Elephas melittensis and E. falconeri, and their remains are found over a wide geographical area, showing that they had an extended range. In the second book of the 'Æneid' Virgil notes a tradition to the effect that Sicily was at one time a part of the mainland, and it is now believed by many that long ago Italy was connected with Africa by a neck of land and that Malta and other places, now islands, were a part of it. Over this ancient bridge the pigmy elephant is supposed to have made their way into Europe, where their tracks can be traced in many localities. In Malta most of the skeletons have been found, while others have been discovered in various parts of Italy, and among other remains in many parts of Europe. These were real pigmies, while the so-called dwarf elephants of today are merely elephants whose growth has been retarded in some natural or artificial manner.

"The pigmies, however, were not all elephants, as at this time pigmy horses roamed the slopes and valleys of North America. They were the ancestors of our present horse, and their remains have been found in such quantities that more than twenty different kinds have been recognized. The smallest of these pigmy horses was about as large as a fox, and differed considerably from our present horse. It lived in what has been termed the Eocene time, and is called Eohippus. Instead of walking on the tip of a single toe or hoof, as does the horse of to-day, it had four well developed toes and a rudimentary fifth. In a later bed of this same time is found the Orohippus, a pigmy horse with four perfect toes in front and three behind. A great many ages later, in beds of the Miocene time, bones of the Mesohippus appear. Then the horse was as large as a sheep—equalling in size the pigmy elephant. Its feet were still divided as it had three toes and the splint of another in each forefoot, and three toes behind. Following this came other forms, as the Anchitherium; then the Hipparion, as large as a donkey; and finally the Pliohippus, with a single toe on each foot, is found the direct ancestor of our great horse of to-day, in the feet of which, if one carefully examines, are to be found rudimentary splint bones that are the representatives of the toes that were fully developed in the ancient forms. In Yale College a very complete set of these strange horses, from the pigmy form of long ago to the horse of today, can be seen, the result of the researches in the far West of Prof. Marsh.

"A few months ago a pigmy whale was washed ashore on the New Jersey coast, and was sent to the National Museum. In appearance it resembled the enormous finback, but instead of being sixty or eighty feet in length, and weighing several tons, it measured only nine feet in length, and was accompanied by a baby pigmy that was little over a foot long. The pigmy whales properly belong in the Pacific Ocean, and are often seen on the California coast; but this specimen probably strayed around the Horn, and with perhaps a few companions was wandering about the Atlantic, or, as some one suggested, waiting for the canal through the isthmus for a short cut home.

"Among the birds there is a pigmy quail —a delicate little creature, so small that the ancient Chinese used it to warm their hands in cold weather, carrying a bird in each closed palm. Among the quadrupeds the pigmy deer is perhaps the most interesting, and when seen it seems a perfect antelope in miniature. It is the Cephalopterus pygmæus, and is confined to South Africa—a most delicate and fragile little creature, being hardly over twelve inches in length. The head is long and pointed, the ears short, and the horns like toy ones, and very delicate and slender, being less than two inches in height, highly polished, and jet black.

"Quite as much of a pigmy is the Sultana antelope, found in the hilly regions of Abyssinia. Its height at the shoulder is only fourteen inches; the horns are extremely thin and about four inches long. The young of these midgets of the hoofed tribe are beautiful little creatures, those of the antelope being about eight inches long when born, and with their soft-colored fur, delicate pipe stem-like limbs, large and expressive eyes, they are, perhaps, the most attractive of any of the minute animals. I have," continued the artist, "nearly all these interesting creatures in my collection, and when placed together they present a striking and interesting appearance, telling a story of the curious modifications to which the various forms of life are subject. I am going to make a model of each one for a private museum, and they are to be placed in contrast with the giants. Thus the pigmy whale will be placed beside the right whale, the small elephant next to the giant-mammoth, and so on. In this way the great extremes of life are shown at a glance."—N. Y. Post.

SUNDAY OBSERVANCE.

Constance, the Great, promulgated the first Sunday law, but the day itself in this decree of the Emperor was called the "Salutary Day." And how far away is this wicked ruler's view of the Sunday from our present Puritanical and superstitious view! I give you the text of the Decree:

> "Let all the judges and town-people, and the occupations of all trades, rest on the venerable day of the sun; but let those who are situated in the country, freely and at full liberty attend to the business of agriculture; because it often happens that no other day is so fit for sowing corn and planting vines, lest the critical moment being let slip, men should lose the commodities granted by the providence of Heaven."

The Sunday of the early Christians was not at all regarded as a religious day or as a holy day in any exceptional sense, and perhaps under Constantine was legally set apart as a day of rest, or rather as a fete day, in order to please the populace. So little regarded was it as a day of religious observance, that Sylvester, who was Bishop of Rome, whilst Constantine was Emperor, in order to give to the day greater solemnity, changed the name of the first day of the week from Sunday to "the Lord's day." This is the first intimation we have in history, that is authentic, that the early Church instituted the day to commemorate our Saviour's resurrection.

In the epistles of Ignatius to to the Philippians, it is stated, "that he is a killer of Christ who fasts on the Lord's day or on

Saturday;" and there is no little evidence to show that the Sunday was considered to be a day of relaxation, of joy, and rejoicing, rather than of gloom. The Pharisaical doctrine, which is now so prevalent, of keeping that day with strictness, was, among the Christians of this early period, counted to be a great wickedness.

We are told that in the fifth century, the Christians, after divine service, followed their daily employment. "It was not done" until the meeting or service was quite over, when they might with innocency enough resume them, because the length of time, and the number of hours assigned for piety, were not then so well understood as at present.

In the funeral oration for the Lady Paula, St. Jerome says, "She with all her virgins and widows, who lived at Bethlehem in a cloister with her, upon the Lord's day, repaired duly to the church or house of God, which was nigh to her cell; and after her return from thence to her own lodgings, she, herself, and all her company, fell to work, and everyone performed their task, which was the making of clothes and garments for themselves and for others, as they were appointed."

St. Chrysostom, patriarch of Constantinople, recommended to his audience, after impressing upon themselves and their families what they had heard on the Lord's day, to return to their daily employments and trades.

The Parliament of England met on Sundays until the time of Richard the Third, in the year 1483.

Many of the kings were crowned on Sunday, among whom were Rufus, Stephen, Henry II., Richard I., and John. Richard I., was crowned twice,—once in the beginning of his reign, and again upon his return from the Holy Land,—and both times on Sunday. The daughter of Henry II., was on Sunday crowned Queen of Sicily, at Palermo. King John was first inaugurated Duke of Normandy, and afterwards crowned king, each event transpiring on Sunday.

The first law of England made for keeping of Sunday, was in the time of Edward VI., about 1470. "Parliament then passed an act by which Sunday and many holy days, the feast of All Saints, of Holy Innocents, &c., were established as festivals by law. This provided also, that it should be lawful for husbandmen, laborers, fishermen and all others in harvest, or any other time of the year when necessity should require, to labor, ride, fish, or do any other kind of work, at their own free will and pleasure upon any of the said days,"

In the morning of Sunday, the churches and chapels were opened the after part of the day was devoted to rational enjoyments this was not confined to the Roman Catholics. The Waldenses and other separatist sects observed that order. John Calvin, himself a most narrow minded and intolerant thinker, and the real founder of modern orthodoxy, made no claim that the Puritanical observance of the Sunday was in accordance either with the teaching of Christ or the usage of the early Christians. He explicitly writes in his great theological treatise, "The Institutes:"

> "But it cannot be doubted that everything was abolished at the coming of Christ our Lord. For He is the reality, at whose presence all types vanish; the substance, at whose sight all shadows are forsaken; He, I say, is the true fulfillment of the Sabbath. Being by baptism buried—with him, we have been grafted into a share of his death, that, being partakers of the resurrection, we should walk in newness of life. Therefore, the apostle in another place says, that the Sabbath was the shadow of something future,—that in Christ is the body; that is, the solid, real substance, which in that place he has well explained. This is content, not with one day, but with the whole course of our life, until, being wholly dead to ourselves, we are filled with life of God. Far, therefore, from Christians ought to be the superstitious observance of days."

Luther, whom the orthodox so patronizingly quote as authority, called the strict observance of the Sunday an apostacy from Christ, and recommended that the people attended church in the morning, and then give the remainder of the day to recreation. The Catholic countries, and, indeed, all continental Protestants, observe the Sunday about in the Spirit which Luther taught.—Robert Laird Collier.

A BOOS-KE-TAN.

The Creek Indians of the Hickory Ground town or neighborhood held their annual "boos-ke-tan" last week. This is commonly called "busk," and is the occasion when all the Indians of a certain section, under a local chief, meet for the purpose of taking their "possan" or black drink. The ground is selected by the town chief near some running stream, and a brush shed is constructed in the form of a cross, one end to the north, one to the south, and the others to the east and west. The chief occupies the west end and his subordinate officials the ends to the other points of the compass. After everything is got in readiness, a committee is appointed to go out and bring in four round logs, which are placed with ceremony in the center of the arbor, the outer ends pointing to the four cardinal points, but all touching together in the center.

Fire is produced by friction, which is then placed in the center of this cross. It is estimated with a slow fire these logs will last four days, the usual length of the busk. After the black drink is made the women, who are fasting, dance around the fire, and from twelve o'clock to the middle of the afternoon take draughts of the medicine, which is a powerful emetic, and also wash their faces, hands and feet with it. When the women all get through the men join them, and they dance all night, the women wearing terrapin shells filled with gravel and bound together, with buckskin thongs fastened to their legs or ankles, which rattle and aid in keeping time in the dance. They sing their peculiar songs, interspersed with yells by the men, and it is wonderful the amount of labor that is endured during these exercises. The women are tastefully and brilliantly dressed and decorated with their finest clothes, ribbons and ornaments. The next day the men go through pretty much the same ceremonies, and take their medicine.

After this, on the third day, the women bring the children, who are made to drink. They are washed in it, scratched on the arms and legs with a scratcher of many points, so the medicine can the sooner penetrate. These scratchers are usually made of garfish teeth, or in the absence of those they are made by sticking numerous pins through a feather. After each class get through with their duties of drinking and dancing they are permitted to go to the stream and bathe, when they can return to the camp and partake of food and prepare for the dance at night. During all these ceremonies the women and children occupy one camp and the men another.

On the fourth day the ashes are all cleaned up, and each participant sprinkles some of it on himself, the fire is renewed, and then begins the final dance. The men all come in with sticks, in the ends of which are inserted four white feathers. With these they keep time in all sorts of motion during the dance. All this is the ceremony that has to be gone through with before any of the members are allowed to eat green corn, and is, properly speaking, the "green corn dance."

In some towns of old standing these ceremonies are kept up eight days with much formality and strictness. In Tookabatcha town there now exist brass plates that have been handed down from one generation to another, probably for hundreds of years. They are now in possession of old Captain Tookabacha Hajo, one of the finest looking old Indians I have ever met, and is said to be one of the best men throughout the territory. These meetings are not altogether for the purpose of taking medicine, but are productive of much good. The chiefs of these clans take occasion to call together all the young men and explain to them the laws of the country and exhort them to be obedient to these laws, to maintain friendship among themselves and neighbors, and all return thanks for the blessings of the past year and ask the Great Spirit to continue them for the year to come.—[Muscogee (I. T.) Cor. N. O. Times-Democrat.

ABOUT PERFUMES.

It does not follow nowadays, says the New York Sun, because a toilet perfume is made in France or any other foreign country, that it is superior in quality to one of American preparation. Such was formerly the case, but the art of making fine perfumes has been carried to such perfection of late years in this country that not more than one-eighth as much of the French preparation is sold in the United States to-day as was sold ten years ago. While the best American-made perfumes are equal in quality to the finest of the French, such could not be the case if we had not that country to depend upon for our essential oils. The flowers that lead as providers of popular perfumes for the handkerchief and toilet are the jasmine, violet, tuberose, rose, bitter orange flower and cassia. Combinations of these with ambergris and musk result in all the delicious perfumes that are used. These flowers, or most of them, are indigenons to the south of France. Cassia, the blossom of the cinnamon tree, comes from the East Indies, as does the tuberose. The oils of violet, tuberose, jasmine and other delicate flowers, being volatile, must be extracted in a peculiar manner. in order that they may be retained any length of time for use. The oils of these flowers are extracted and held by grease absorption. A layer of refined fat is spread upon a large wire sieve with small meshes. Upon this bed of grease the delicate petals of the odor-bearing flowers are scattered loosely. Then a layer of fat is spread upon the flowers, and then more petals, and so on until the sieve is filled. It is then covered up and subjected for ten or twelve hours to a temperature just below the point at which the fat would melt. Then the heat is increased until the fat becomes liquid and runs through the meshes of the sieve into a vat arranged to receive it, charged with the perfume of the flowers. The grease, holding the rare oils of the flowers, is then sealed in cans and is ready for market, which it finds all over Europe and in this country. The trade name of the grease is pomade extract. In preparing the perfumes for use the manufacturer treats the pomade with odorless alcohol. The alcohol becomes the affinity of the perfume held by the grease, and it readily leaves the latter and joins the spirits. The grease is still there, however. To remove it from the affiliated perfume and spirits the compound is subjected to a gradually lowering temperature until the grease congeals. It is then an easy matter to run the liquid off, and all that is left to do is to bottle it, cork and label it, and it is then ready for any lady's handkerchief. Bitter orange flowers, rose leaves, cassia and other perfumed flowers have fixed essential oils, which are obtained by distillation. The neroli oil of trade is obtained from bitter orange blooms. About $5,000,000 worth of toilet perfumes are sold here every year, the basis for the most of which is imported. In spite of the assertions that the blooms of Florida are as rich in fragrant oils as the French flowers, experimental distillation has not made the assertion good except in the case of the oil of bitter orange flowers. As to roses, in France 100 pounds of rose leaves produce a dessert spoonful of essential oil. In America it requires a ton of leaves to produce the same quantity. Then, again, flowers can't be picked by machinery, and it is not at all likely that floriculturists in this country could secure hands to gather their fragrant blossom harvests for two cents a day, as they can in France. Cologne and toilet waters of all kinds have been so successfully prepared in this country during the past few years that a large export trade in them has gradually developed. As colonge is simply refined, odorless alcohol, perfumed with some essential oil of flowers, there is no reason why it should not be made as well here as elsewhere. All first class toilet waters, with the exception of bay rum, are nothing more nor less than perfumed corn spirits, which have received a medicinal quality by the introduction of balsamic or tonic properties. Genuine bay rum is always imported. Nine-tenths of the stuff used as bay rum is not bay rum at all, but a mixture of the essential oil of bay with common rum or alcohol.

REYNARD'S WAYS.

During the fall of 1869 I witnessed the very shrewd performance of an old fox that had given me the "dodge" for at least a half dozen times. I was a boy then, but I kept as fine a pack of dogs as Middle Georgia afforded. Two of my cousins, living near my father's, also kept a number of splendid hounds. We hunted together, and the sounding of one horn brought all the dogs together. We rarely failed to catch a fox if we could once strike his trail; but the one under consideration had succeeded in worrying us not a little. We always lost the scent at the same place. After running for an hour or more, and allowing the dogs to come very close on her, she would make the circuit of a small mountain, and start directly from that to another on the opposite side of the little creek, but the dogs invariably failed to carry the trail more than thirty or forty rods from the stream. Her bridge was a large pine log that lay across the creek, fifteen or twenty feet above the water The banks were very high.

One fine frosty morning, after a race after her that terminated as all the others had done, it was decided that the next Monday morning—this was Saturday—the other boys were to proceed with the dogs to the "striking" ground and that I should make for the pine log at once and watch for the trick. Our plan was carried out and the secret discovered.

I took my position on a knoll about one hundred yards from the log, with it in plain view, and waited for developments. The "string" ground lay one mile west of my post, and I had just begun to feel like nodding, when I heard Forest, one of the truest and best foxhounds it has ever been my lot to know, strike the keynote, and pretty soon the game was up, and the whole pack of eighteen in full cry, came sweeping around the base of Anawaka Mountain. It was a clear, calm morning with a gentle breeze from the west, and every note was borne to my ravished ear. There were four or five dogs in the pack with a liberal supply of English deerhound blood in their veins, and they sounded the bass notes grandly. The very thick cover of brushwood gave the fox a decided advantage, and one turn around the mountain gave her the lead by at least a half mile. I was listening ahead, when on the top of the ridge across the creek, and directly in front of me. I saw the fox dash into view, clear the little strip of tableland at a few bounds, run across the creek on the old pine log, and make straight up the little knoll on which I sat as motionless as a statue, whirl directly back, after coming within ten feet of me, recross the creek on the same log, leap as far off the log up the creek as she could, and lie as flat as a fox could on bare ground.

I sat still to watch her panting sides and await developments. In a few seconds, on came the pack in full cry led by Alec, a fine young dog of my cousin's. They dashed across the creek, passed me in a twinkling, despite my frantic efforts to turn them back. Casting my eye back to see what had become of the game, I caught one glimpse of her scuddling back toward the mountain on the line she had just come over a few minutes before. Here was the trick. I knew her secret, and as soon as the over-eager hounds had satisfied themselves, that they had been duped by the wily brute, and had come back to strike the scent anew, I succeeded in explaining the trick to them, and in forty minutes after the dodge, around her breathless body, I explained it to the other boys.—J. C. W., in Forest and Stream.

THE COUNTRY OF STILTS.

A writer in Macmillan's Magazine, speaking of the quaint region known as the Landes. says: One need not ask why, since the collection of resin has been one of the chief industries of the Landes, wild creatures of all kinds have become much scarcer than formerly throughout this region, which is still very attractive to the adventurous sportsman, especially if he be likewise a naturalist. The resiniers have had a great deal to do with driving the wolf back to the Pyrenees, not so much by making war upon him as by worrying his nerves by the incessant tapping of the axes. A wolf has a delicate nervous system. A line of railway run through his district is quite sufficient to make him move elsewhere. The boar, a less nervous animal than the wolf, and a more formidable one when attacked, is frequently met in these forests. He has nothing to fear from the resiniers, who, when they see him, have the prudence to let him go on his way, and they treat his spouse, when followed by her young, with even greater respect. If the boar, on the other hand, becomes imprudent and makes nightly raids on a maize field on the outskirts of a village, the villagers organize a hunt. His taste for sweet maize stalks frequently costs him his life ; but he sells it dearly, ripping open dogs and sometimes men, fighting as long as he has strength to strike with his tusks. Curiously enough the boar has a rival here in his congener, the domestic pig, which, having found the air of the forest and freedom sweeter than that of the sty or farmyard, became a self-emancipated poker.

A few years ago these wild pigs—they are known as cochon sauvages—were so numerous in the neighborhood of Cazau and wrought such destruction upon the young pines that the government took energetic measures to exterminate them. The wild pig of the Landes is of the same breed that supplies Paris with its much-prized Bayonne hams. Formerly troops of wild horses roamed the Landes, just as wild horses and cattle roam the Carmargue—the desert of Providence and Languedoc. They have entirely disappeared. Roebucks, which were once plentiful, are getting scarce. Smaller quadrupeds, such as foxes and hares, are very numerous, and the wildcat is found in the forest. The Landes are peculiarly rich in ornithology. Birds which have almost, if not quite, disappeared from other parts of western Europe, such as bustard, the wild goose, and the wild swan, linger in their solitudes. Flamingoes are occasionally seen in districts where the marshes have not been drained, and there are wild pheasants about the banks of Leyre. There are tortoises in the sand, and the lakes contain a great variety of fresh-water fish. Sportsmen to whom the pleasure of shooting something in old Europe that is really wild is heightened by natural obstacles, such as thickets that can only be penetrated by means of an axe, sand sloughs into which they may step unawares and not be heard of more, and forest flies capable of inflicting positive torture, would find in the Marensin, the district immediately south of Lake Cazau, an ideal hunting-ground. If the visitor takes out his shooting license at the mairie of commune which he chooses for the scene of his exploits, he may blaze away without fear of hindrance; but it is necessary that he should pay this local tribute, for the commune has the right to stop people from shooting within the bounds unless they are provided with one of its own licenses. The license costs 25 francs. Half of the money goes to the commune in which it is taken out, and the other half to the state.

DIAMONDS.

Diamonds are chiefly found in India and Brazil. They are also found in Malacca, Borneo, Algiers, Australia, Russia, and in some portions of our own country. The first diamonds that were known to the traders in precious stones in Europe, were brought from Vasapoor and Golconda. The discovery of the mine in the latter place, is attributed to a poor shepherd, who, while tending his flocks, stumbled upon what appeared to him a pretty pebble. This stone he gave in exchange for some rice to a man as poor as himself. After passing through several hands, it fell into those of a merchant, who knew its worth, and who, after diligent search, succeeded in finding the mine. Having made excavations he found a reddish earth, mixed with pebbles, and intersected by white and yellow veins, resembling lime. The diamond mines of Brazil were discovered by a curious circumstance, in 1630. Some miners in searching for gold found some curious pebbles, which they carried home to their masters as curiosities. Not being considered of any value, they were given to the children to play with. An officer who had spent some years in the East Indies saw these pebbles, and sent a handful to a friend in Lisbon to be examined. They proved to be diamonds. A few were collected and sent to Holland, and were pronounced to be equal to those of Golconda. The news soon reached Brazil and those who possessed any of the "pebbles," soon realized large sums of money. The Portuguese Government laid a claim upon all diamonds that might be found thereafter, and a search was made and mines discovered. The diamond is so rare and valuable, it is only carbon or charcoal in its purest state, and can be consumed by fire at a less heat than that required for melting silver. Nature's process for concentrating or crystalizing this substance remains a mystery. The numerous attempts to produce diamonds artificially, have not as yet turned out successfully. It is the hardest of all known substances, and the purest and most brilliant of all gems. It varies in color from red, blue, yellow, green, brown, gray, and even black. It is always found crystalized, and in its natural state, the surface is dull and uneven. The ancients were very familiar with the gem, though entirely unacquainted with the method of cutting or polishing it. The four large clasps of the monarch Charlemagne's mantle still preserved in Paris, consists of diamonds in their rough state.

A QUEER WAY TO GET FRESH WATER.

In the Persian Gulf is a place called Babrin, where men go a-fishing for drinking water. So, at least, a sailor who has been there told a writer in the Sun.

"I don't know who discovered the fact, but there are numberless springs of ice-cold water at the bottom of the gulf near the shore, where the water is about sixty feet deep. This must have been known when they first set up the town, of course, or it wouldn't have been started there. This water gets salt enough, though, before it gets from the bottom, and so they have to send down after it. When a man's wife calls him to go after a pail of water, and be quick about it, over in Babrin, he grabs a goat-skin bag, yells at the first neighbor he sees stretched out in the sand, and the two jump into a boat and row out a short distance. The man who is after the water wraps the goatskin around his left arm, with the mouth of the bag in his hand. Then he takes into his other hand a heavy stone. This stone is tied securely to the end of a long and strong line, for stones are valuable property there. Without them no one could go out and fetch a pail of water, and they are very scarce. With the stone firmly clutched in his hand the man dives into the water, and down he goes to the bottom. When he reaches the cool, fresh water gushing up from the sand he opens the mouth of his goatskin bag, drops the stone and floats upward in the strong current. The bag quickly fills and the mouth is closed again.

"When the man reaches the surface his companion lifts the bag into the boat, and the diver follows. The stone is then carefully drawn up, and the men go home.

"The water is cold and refreshing when it comes up from the depths of the sea, but it soon gets flat and warm. The more you drink of it the thirstier you get, but the natives can get along on a few swallows of it now and then. The requirements of the climate keep the divers at work in the submarine springs for all they are worth, and the shore is lined with their boats all day long. These springs are said to be the outlet of large natural aqueducts in a range of mountains more than 500 miles from the coast, but I guess they would have a hard time to prove that theory if they were called upon to do it."

THE FIGHTING INSTINCT IN MAN.

There is not the slightest certainty that any invention, however terrible, would put an end to war; while there is almost a certainty that if such an invention were perfected, it would grievously increase the miseries of mankind. Taken in the lump, men will face any means of destruction whatsoever, if also they possess it themselves. Give two men pistols, and they will fight across a handkerchief. They are not afraid of death, but only of death without a chance of victory. King Theodore of Abyssinia asked his courtiers, when the rocket sticks fell at his feet, if he could reasonably be expected to face things like those, and ultimately, in pure despair of defeating science with unscientific weapons, killed himself; but if he also had posessed rockets, he would have fought on. No men, not even Prussian soldiers or English sailors, will face shells without shells to throw back; but when they have shells they face the enemy's shell as bravely as they did the old round shot. The methods of war are changed by science, but war is not extinguished. Suppose it true that able chemists and mechanicians could invent a method of throwing asphyxiating vapor on a sleeping army, what would be the result ? First, the adoption of some protective covering, such as iron-clad huts for sleeping in; next, the adoption of a method of encamping which would spread the army over a surface too great or too uneven to be reached; and next, the use of such devices as were used by the assailing force. Huxley would march with his fishermen to choke Tyndall and his Alpine climbers. War would then consist mainly of efforts to obtain advantageous positions, from which showers of death would be thrown, but war would not cease. Forlorn hopes would be organized among chemists or mechanicians as easily as among soldiers, enormous rewards would be paid to the new warriors, and nations would fight each other as briskly as ever.—London Spectator.

CRINOLINE IN CLASSIC DAYS.

The Frankfurter Zeitung contains an interesting article on the origin and history of that revived monstrosity, the crinoline. Like many other devices which we are accustomed to regard as comparatively modern, the crinoline seems, in reality, to be exceedingly ancient. Hesiod, who wrote in the eighth century before Christ, must have observed something of the kind, for he advises young men not to be led astray by certain women of his day, who wore their clothes puffed out behind. For more than twenty centuries after Hesiod's time, however, the crinoline languished in obscurity; and it was not until after Queen Elizabeth had come to the throne of England that the farthingale became fashionable. The farthingale, or vertugade, which served to extend the skirts of the ladies of quality, who were Shakespeare's contemporaries, is described as having been made of hair and wadding. In the eighteenth century whalebone generally took the place of these cumbrous materials, but already iron or steel hoops were in use in England, and, covered with silk and cotton, steel hoops won their way to universal favor until, a few years ago, they were partially superseded by folds of highly starched muslin. If "dress improvers" were actually worn by the Greek women of Hesiod's day, it is not improbable that they were also worn 200 years earlier, and that Helen, when she fled with Paris to Troy, wore some primitive kind of crinoline.

A SINGULAR HAVEN IN THE SEA.

It is said that a singular spot exists in the Gulf of Mexico, some ten miles to the southward and westward of Sabine Pass, a mile or so in diameter, upon the surface of the sea, which looks like all the rest of the Gulf during calm weather, but when the wind freshens to a gale and the waters about it become agitated, takes on a reddish color and becomes thick and muddy. The place has been called the "oil pond" that, while there may be a tremendous sea running all around the place within the circle of surf the water is comparatively quiet, and vessels which otherwise would be blown ashore or swamped, can there ride out the heaviest storms in safety, and have done so in hundreds of instances. The water is about twelve feet deep, and a pole can be pushed twenty-five or thirty feet through the soft and peculiar mud forming the bottom. This mud is different from anything on the coast, of a soapy character, and of remarkable cleansing properties, being often used to clean the decks of coasting vessels. The oil which renders the surface of "the pond" so smooth is supposed to come from the mud at the bottom, and many think there are deposits of petroleum not far from the surface, but of this I know nothing. Providence has thus provided a safe shelter for small craft out in the open sea, for the "oil pond" once reached during a gale is just as safe as a vessel lying under the lee of a lee wharf in Gaveston harbor.

THE INVENTION OF INK.

When ink was first introduced does not seem to have been decided, but given the paper and the pen, a colored medium which would show on a light surface was so obvious a want, and one so readily found, that there is no extraordinary credit due to the unknown inventor. It appears to be only of comparatively late years that black ink has been almost universal. Roman ink was red, purple and gold, and inks of blue, green, violet, and other shades were not uncommon. It is said that simple as is the composition of ink, "we possess none equal in beauty and color to that used by the ancients; the Saxon manuscripts written in England exceed in color anything of the kind." Modern ink makers will deny the superiority of the ancients; but who shall say whether words written in the ink manufactured to-day will stand as vividly centuries hence as those Saxon manuscripts have stood? It is difficult to see how the writing materials of the present day can be improved upon, for convenience at least, setting aside questions of lasting inks, which the generation that uses them cannot settle. Paper, rough and smooth, fluent inks of any color that the writer may believe suitable to his eyes, pens as fine as a needle or as blunt as a spade, are all to be bought in every street. The great lack of the age seems to be ideas at once more novel and sensible in the record of which these serviceable materials may be employed.—[London Standard.

CANINE ATTACHMENT FOR A HORSE.

A horse which once attracted great attention in the streets of New York fell lame and was sent to the country. There he formed the acquaintance of a dog—a cross between the St. Bernard and Newfoundland—and the two soon became very fond of each other. When the horse died straw was spread over his body until a pit could be dug. The dog seemed to be disconsolate. He ran off to a neighbor's house where his brother had a home, and an hour later the two dogs were seen to approach the carcass. They carefully removed the straw from the body, squatted down, one at the head and the other at the tail, and howled mournfully, then recovered the remains and crept silently away. The workmen who witnessed the scene were strangely moved by it, and they insist that it was one of the saddest and most touching of ceremonies. The dead was placed out of sight, but the dog often paid a visit to the grave. Some of the attachments formed in the animal world are not only strong, but marked by a high order of intelligence.—Turf, Field and Farm.

COLLEGE MEN IN LITERATURE.

Disputants about the value of college education have drawn up the following lists of eminent names and given them to the public to say which is the greater:

NOT COLLEGE GRADUATES.	COLLEGE GRADUATES.
Walt Whitman	Longfellow.
Whipple	Willis,
Trowbridge	Hale.
Field	Ticknor.
Parton	Motley.
Bayard Taylor	R. H. Dana, Jr.
Eggleston	Joseph Cook.
Harte	Emerson.
Howells	Hawthorne.
James.	Robert Grant.
Aldrich	Lowell.
Lathrop	Lodge.
Stockton	Holmes.
Piatt	Prescott.
Cable	Bancroft.
Crawford	Stimson.
Fawcett	Prentice.
Gilder	Alden.
Harris	McMaster.
Carleton	Warner.
Mark Twain	D. G. Mitchell.
Stoddard	Stedman.
Burroughs	John Fisk.

A NEW USE FOR TOADS.

The latest and most ingenious way of getting rid of roaches and water bugs we have heard of, says the Scientific American, is related of a citizen of Schenectady, whose kitchen was infested with them.

A servant, hearing that toads were an antidote, caught three ordinary hop toads, and put them in the kitchen. Not a roach or water bug, it is stated, can now be found in the house. The toads have become domesticated, never wander about the house, and are so cleanly and inoffensive that there is no objection to their presence.

Another use for toads is to employ them for insect destroyers in the garden. They are determined enemies of all kinds of snails and slugs, which it is well known can in a single night destroy a vast quantity of lettuce, carrots, asparagus, etc. Toads are also kept in vineyards, where they devour during the night. millions of insects that escape the pursuit of nocturnal birds, that might commit incalculable havoc on the buds and young shoots of the vine. In Paris toads are an article of merchandise. They are kept in tubs, and sold at the rate of two francs a dozen.

CURRENT LITERATURE.

Phonetics.

THE COMPLETE PHONETIC ALPHABET, ETC. Edwin Coombs. A. J. Graham, N. Y.

This book is one of the outgrowths of the spelling reform movement—a movement which is gaining strength very rapidly in these days. Those interested in the matter will find much of value in Mr. Coombs' work, and those who think it impossible to devise an alphabet to take the place of our present unscientific one will be surprised to discover the problem so nearly solved in this little book. In the words of a late reviewer, it may be said: "In this and in various other matters Mr. Coombs' book gives evidence of an amount of care and laborious attention to detail, which happily supplements the ripe scholarship and thorough familiarity with phonetic principles manifested in its pages. On the whole it is not too much to say that "The Complete Phonetic Alphabet" is a work which no one interested in the correct representation of English speech can afford to neglect reading."

Political History.

AMERICAN CONSTITUTIONS. THE RELATIONS OF THE THREE DEPARTMENTS AS ADJUSTED BY A CENTURY. By Horace Davis, Baltimore, N. Murray (Johns Hopkins' University), 1885.

This is one of the series of "Johns Hopkins' University Studies" now in course of preparation. In common with all the books in this series, the present one represents adequate scholarship and original thought. To one acquainted with the voluminous literature of the subject it may seem impossible to compress a just and fair treatise within the limits of a brochure of seventy pages; and yet so far from being trivial or a mere outline it is philosophical and comprehensive to a remarkable degree. Any attempt to characterize the work within the limits of a mere notice would be worthless. At a later day a review will be attempted.

Santitation.

A GUIDE TO SANITARY HOUSE INSPECTION, OR HINTS AND HELPS REGARDING THE CHOICE OF A HEALTHFUL HOUSE IN THE CITY OR COUNTRY. By W. P. Gerhardt, Sq. 16 mo. Cloth. Price, $1.25. New York: John Wyley & Sons, 1885.

This book is an attempt to outline a practical method of sanitary house inspection. The author abounds in good sense, and his little book is a vade mecum to those who regard health as one of the desiderata of housekeeping. Its suggestions are all practical and, without making any pretentious claims, it embodies the latest results of sanitary science, free from technicalities and "cranky" notions.

Evolution.

EVOLUTION IN HISTORY, LANGUAGE AND SCIENCE. Four addresses delivered at the London Crystal Palace School of Art, Science and Literature. Price 15 cents, post free. J. Fitzgerald, Publisher, 393 Pearl street, New York.

This interesting work forms a valuable addition to the series of popular scientific works known as the "Humboldt Library." The number of works published in that series now amounts to seventy, including many of the most celebrated writings of Huxley, Spencer, Tyndall, Darwin, and others.

Astronomy.

PUBLICATIONS OF THE WASHBURN OBSERVATORY. Vol. III. Madison: Wisconsin State Printers. 1885.

The University of Wisconsin has a reputation for physical studies not excelled in the West. In astronomy, especially, it has reached undisputed eminence through the valuable labors of Prof. Holden, as Director of the Washburn Observatory. The publication before us gives the results of observations of the 303 fundamental stars for the southern zones of the Astronomische Gesellschaft.

Other Publications.

The Inter-Oceanic Problem and its Scientific Solution. An address before the A. A. A. S. at Ann Arbor. Elmer L. Corthell, C. E. 1885.

Catalogue of Phaenogomous and Vascular Cryptogamous Plants of North America. By Dr. J. H. Oyster, Paola, Miami Rep. Print. 1885.

The Shells of Pettis County, Mo. By F. A. Sampson, Sedalia: F. H. Reynolds. 1885.

Voice of Singers. By Carl H. Von Klein, A. M., M. D. Columbus, O.: Ham & Adair. 1885.

Proceedings of the American Association for the Advancement of Science. XXXIII Meeting. Parts I and II. Salem. 1885.

Bulletin of the Illinois State Laboratory of Natural History. Vol. II. Art. III. Parisitic Fugi of Illinois. Part I by T. J. Burrell, Peoria. J. W. Franks & Sons. 1885.

Proceedings of the Boston Society of Natural History. Vol. XXIII, Part I: Boston. 1885.

Bulletin of the Sedalia Natural History Society. Sedalia. W. H. Reynolds. 1885.

Annual Report of the Kansas City Public Schools, 1884-5. Kansas City: P. H. Tiernan. 1885.

Some Titles From The Magazines.

"Atmospheric Electricity." P. H. Vanderweyde, M. D. The Electrician and Electrical Engineer for October.

"Abraham Lincoln in Illinois." E. B. Washburne. North American Review for October.

"America and the Vatican." W. W. Astor. Same.

"Actinic and Visal Focus in Photo-Micrography with High Powers." Jacob D. Cox. American Microscopical Journal for October.

"Ancient Canals on the South-west Coast of Florida." A. E. Douglas. The American Antiquarian and Oriental Journal for October.

"A Biography of the Halibut." C. Brown Goode. The American Naturalist for October.

"Campaign of 1861-2 in Kentucky, Unfolded through the Correspondence of its Leaders." (First Paper.) Gen. Wm. Farrar ("Baldy") Smith. Magazine of American History for October.

"Crystalline Rocks of Alabama." C. H. Hitchcock. The American Journal of Science for October.

"Cope's Tertiary Vertebrata." J. L. Wortman. Same.

"Clinical Aspect of some Disorders of the Gastro-intestinal tract of the Horse." Thos. B. Rogers, V. S. The Journal of Comparative Medicine and Surgery for October.

"Camping Tour to Yosemite Valley." I. L. Kephart, D. D. Microcosm for October.

"Chemistry of What we Eat." Henry A. Mott, Ph.D., etc. Same.

"Commensurability of Motions." Prof. Asaph Hall. For. Assoc. R. A. S. The Observatory (English) for October.

"Comparison (A) of British and Metric Measures for Engineering Purposes." Arthur Hamilton-Smythe B. A., etc. Van Nostrand's Engineering Magazine for October.

"Cylinder Condensation in Steam Engines. An Experimental Investigation." Chas. L. Gately and Alvin P. Kletzsch. The Journal of the Franklin Institute for October.

"Crumpling of the Earth's Crust." W. B. Taylor. American Journal of Science for October.

"Dogs (The) of Æsculapius." A. C. Merriam. The American Antequarian and Oriental Journal for October.

"Device for Testing Refractive Index." (Illust.) The American Monthly Microscopical Journal for October.

"Efficiency (The) and Duration of Incandescent Lamps." (Illust.) The Electrician and Electrical Engineer for October.

"Electrical Furnace and the Reduction of the Oxides of Boron, Silicon, Aluminum and other Metals by Carbon." E. H. and A. H. Cowles, and C. F. Mabery. American Journal of Science for October.

"Emmerich's So-Called 'Naples Cholera Bacteria.'" The Journal of Comparative Medicine and Surgery for October.

"Electric Conductivity of Metals and their Alloys." M. Lazare Weiler. Van Nostrand's Engineering Magazine for October.

"Early (The) Study of Plants." Eliza A. Youmans. Popular Science Monthly for October.

"Energy (The) of Life Evolution." Prof. E. D. Cope (Illust.) same.

"Fallacy (The) of 1787." A. W. Closon. Magazine of American History for October.

"Grant's Military Abilities." By a Confederate officer. Rev. H. W. Cleveland. Same.

"Geometrical Form of Volcanic Cones and the Elastic Limit of Lava." G. F. Becker. American Journal of Science for October.

"George Elliot's Private Life." E. P. Whipple. North American Review for October.

"How Plants Grow." H. W. S. Worsley-Benison, F. L. S. The Journal of Microscopy and Natural Science (English) for October.

"Human and Bovine Tuberculosis." J. M. Heard, M. R. C. V. S. The Journal of Comparative Medicine and Surgery for October.

"How to Quell Mobs." Fitz-John Porter. North American Review for October.

"Helen Hunt Jackson." Jeanne C. Car. The Woman's Magazine for October.

"Homes (The) of the Oneidas." Rev. W. M. Beauchamp. Magazine of American History for October.

"Inhuman Crimes in England." Cardinal Manning. North American Review for October.

"Interbond of the Seen and Unseen." Collected by the author of "Scientific Materialism." The Journal of Science (English) for October.

"Letters and Recollections of Grant." Admiral Ammen. North American Review for October.

"Mythic Dry Painting of the Navajos." W. Matthews. The American Naturalist for October.

"Madmen and Madness at Rome." The Journal of Science (English) for October.

"Microscopic (The) Structure of Iron and Steel." F. Lynwood Garrison. The Journal of the Franklin Institute for October.

"Microscope (The) and How to Use It." The Journal of Microscopy and Natural Science (English) for October.

"New (The) Star in the Great Nebula of Andromeda." E. W. Maunder, F. R. A. S. The Observatory (English) for October.

"On the Supposed Germinating Powers of Mummy-Wheat." Henry King-Parks. The Journal of Science (English) for October.

"Origin (The) of the Utes. A Navajo Myth." W. Matthews. The American Antiquarian and Oriental Journal for October.

"Observations Upon the Tertiary of Alabama." T. H. Aldrich. Journal of Science for October.

"Port Royal (The) Expedition, 1861. The First Union Victory of the Civil War." Brig.-Gen. Egbert L. Viele. Magazine of American History for October.

"Psendocyclosis (The) In Amœba." G. C. Wallach, M. D. American Monthly Microscopical Journal for October.

"Prehistoric Cities of Central America." (Illust.) L. P. Gratacap. The American Antiquarian and Oriental Journal for October.

"Pond Life II." W. E. Hoyle, M. A., etc. The Journal of Microscopy and Natural Science for October.

"Physical (The) Basis of Phenomena." H. H. Bates. Van Nostrand's Engineering Magazine for October.

"Relations (The) of Mind and Matter." (Continued.) Chas. Morris. The American Naturalist for October.

"Study (A) of Recent Earthquakes." M. A. Daubree. Popular Science Monthly for October.

"Second Law (The) of Thermo-Dynamics." J. Burkitt Webb. (Illust.) Van Nostrand's Engineering Magazine for October.

"Taensa Grammar and Dictionary" (The). D. G. Brinton, M. D. The American Antiquarian and Oriental Journal for October.

"Trading Rat. (The)" Mrs. E. E. W. Hatch. The Popular Science Monthly for October.

"Traces of Prehistoric Man on the Wabash." Jno. T. Campbell. The American Naturalist for October.

"Three New Portraits of Washington. Composite Photography." (Illust.) W. Curtis Taylor. The Journal of Franklin Institute for October.

"Water Supply (The) of Ancient Roman Cities." Prof. W. H. Corfield. Van Nostrand's Engineering Magazine for October.

"White Ant (The) A Theory." Prof. Henry Drummond. (Illust.) The popular Science Monthly for October.

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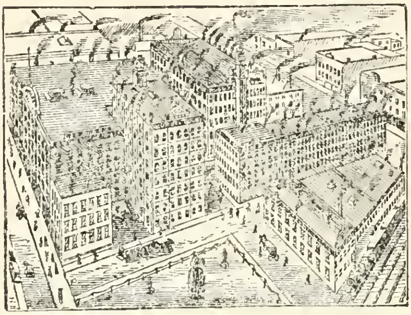

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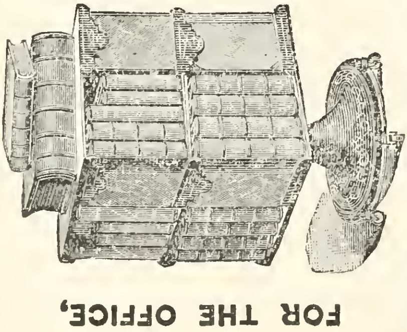

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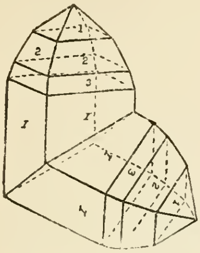

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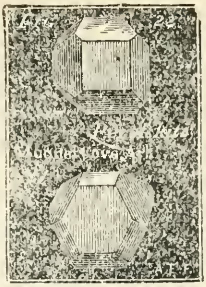

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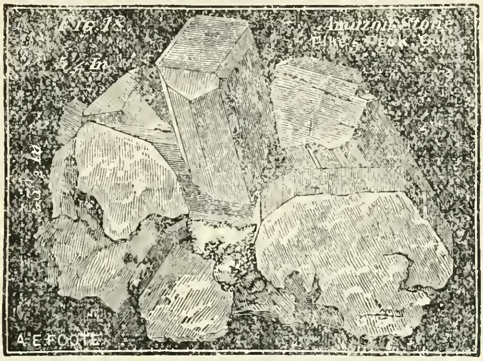

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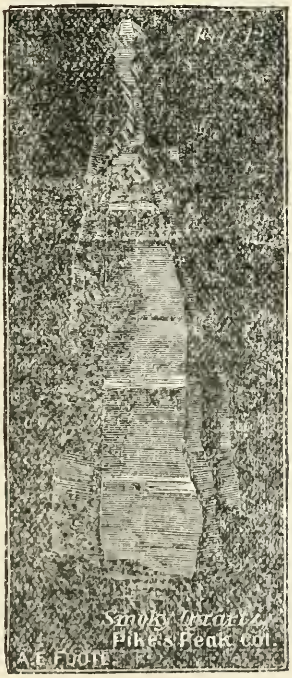

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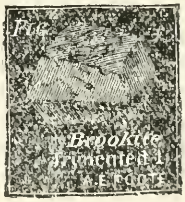

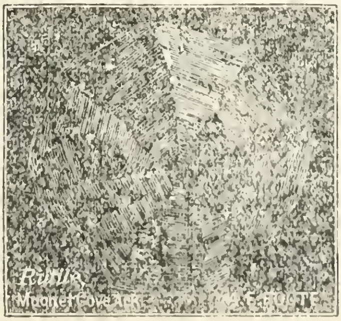

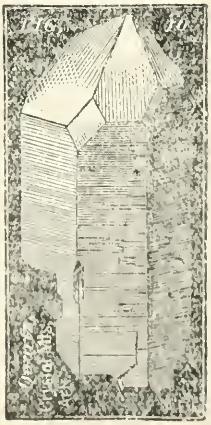

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